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# GEOGRAPHY

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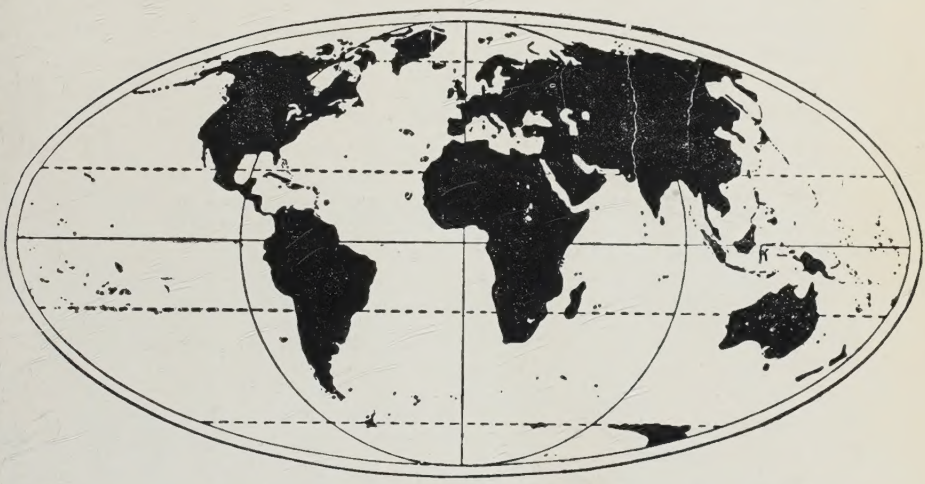

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# THE PHYSICAL BACKGROUND OF NORWEGIAN AGRICULTURE*

AXEL SÖMME

THE most salient fact in Norwegian agriculture is the ripening of barley and the harvesting of potatoes at 70° N., whereas in Canada agriculture finds its northern limit much further south. The shape of the North Atlantic is quite different from that of the North Pacific and affords easier access to the north and east for tropical air and Gulf Stream water than the Pacific does to the corresponding air and water masses. This gives Norway its mild winters and ice-free fjords and its comparatively long growing season. It is, however, other climatic factors which ripen barley in the far north.

Fig. 2 shows, to the left, the mean temperatures of July, not corrected for the altitude. The summer temperature is high for the latitude, but low in itself. The south-eastern, lower part of Finnmark and some other favoured minor areas there lie between the same isotherms, viz. 12° and 14° C., as the upper part of the valleys of eastern Norway. Alta, which is representative of the best agricultural regions of Finnmark, has a July temperature slightly above 12° C., whereas the Norwegian University School of Agriculture at As south of Oslo has an average July temperature of exactly 16° and is fairly representative of the lowland areas round the Oslofjord. A difference in the mean July temperature of less than 4° C. or 7° F. within a difference of about 10° in latitude is indeed very low, the average temperatures along the parallels 60° and 70° N. being 14° and 7° respectively.

Most of the farm land of Norway is to be found in the first category on my map. In the second and particularly in the third category, you will find farming mostly in areas having a local climate well above the average of the region. In the valleys of these regions you will find the old farms on sunny sheltered slopes away from cold air pockets and streams, along the fjords, where the steep fjord sides curve. There you will find a relatively calm air mass while the wind is rather fresh in the middle of the fjord. On the coast you will often find these old farms at the foot of steep mountains facing the prevailing strongest winds. There you will also find a small pillow of calm air, improving the local climate. At the island of Luröy, close to the arctic circle, the main farm lies in front of a high mountain. When the south-west wind during the winter storms sounds like thunder, you can cross the farm yard with a naked candle in your hand.

*The first of two lectures given in London and some other British Universities in May, 1950, somewhat abbreviated. The second lecture will appear in the December number of *Geography*. Professor Sömme is head of the Department of Geography in the Norges Handelshöyskole, Bergen. The volumes *Norway in Maps*, prepared by Professor Sömme and his colleague Dr. Tore Sund will be known to many readers of *Geography*, in whose pages they were reviewed (1948, p.95).

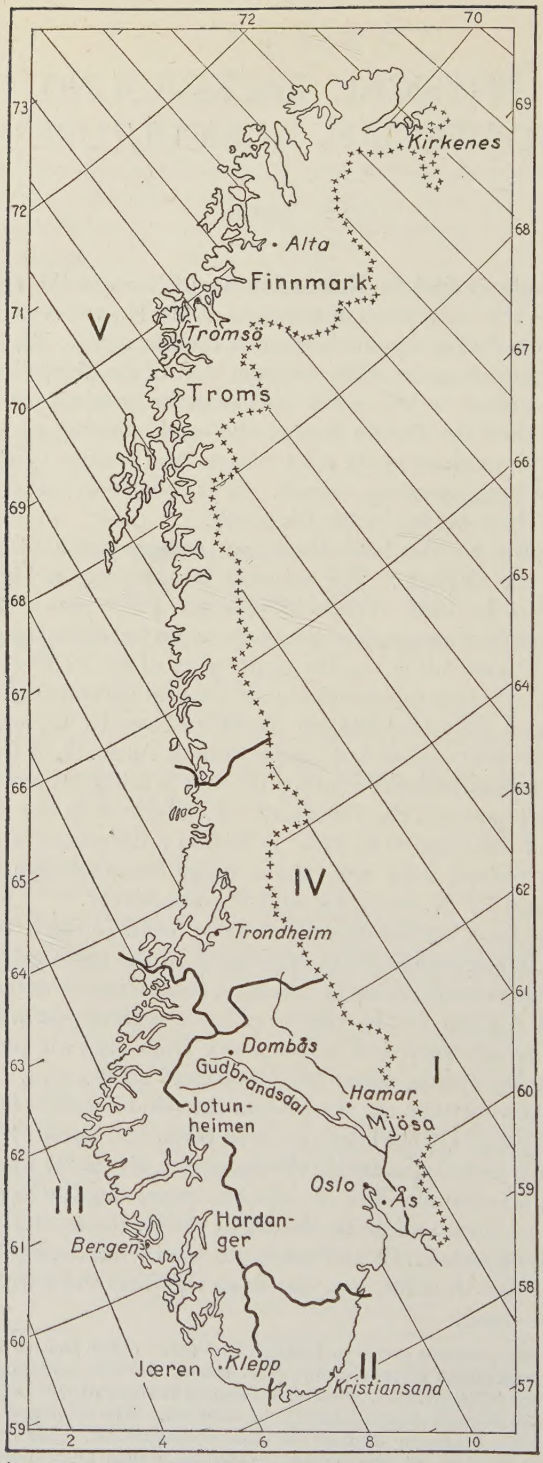


Fig. 1.—Position and names. The black lines indicate main division of Norway : I Eastern ; II Southern ; III Western ; IV the Trondheim region ; V Northern.

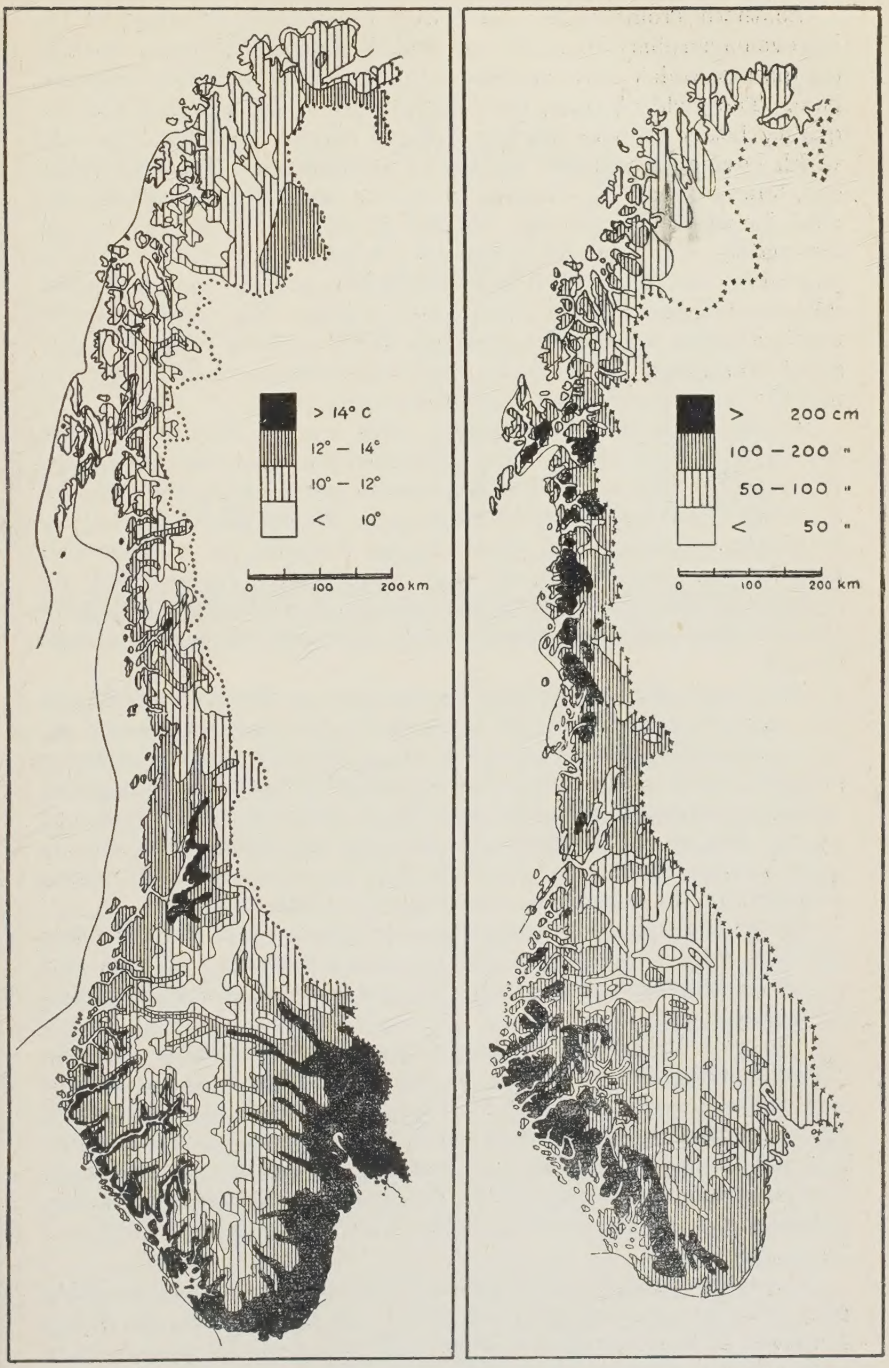


Fig. 2.—Mean July temperature (1861–1920) and annual precipitation (1876–1915).

Southern Troms, with a mean July temperature of about 12° C., has even a surplus of potatoes and milk for sale in Finnmark. Most of the diseases which elsewhere reduce the yield of potatoes are unknown here. The yield of grass, the principal crop here, is higher and the quality better than in the best lowland regions of eastern Norway, which have an insufficient amount of precipitation. The high yields can, however, only be obtained in the far north if local varieties are used for seed. To get the required quantity of such seed is, unfortunately, a problem which has not yet been solved. The hay is, as you know, cut just when it begins to flower, and the cool, but moist northern summer permits a high yield in grass. Ripe seed, however, requires higher summer temperatures which are only found in a few selected localities in the interior, and even there you cannot expect to find the required summer temperatures every year.

In the fourth and last category, with a mean July temperature below 10° C., you will find the high mountain pastures of southern Norway. On good soil and with adequate water supply the yields of these mountain grasses may be rather high. They reproduce mainly by off-shoots. Recent micro-climatological research by a Norwegian botanist has proved that the high temperatures required for the ripening of seed of the local grasses are also found at this altitude on selected spots, the temperature being measured, of course, at the ground.

The temperature figures used on my map are those recorded from our weather stations, and the temperature has been measured 2 m. above the ground. The geographer can use these figures better than a biologist, because his interest in respect of climate and agriculture mainly concentrates upon the difference in temperature from region to region. But we must also bear in mind that the difference in temperature between the 2 m. level and the levels where the different plants actually live, may vary from one locality to another.

We know little about temperature and plants. Our plant breeders add the daily temperatures for the period between seed-time and harvest, each plant requiring a specific amount of heat within a period of varying length.

The year 1949 had extremely low summer temperatures in the Trondheim region and further to the north. Some warm days in September, however, brought the high temperatures required for the ripening of the grain. The yield was fairly high, partly due to the long interval between seed-time and cutting, amounting to 107 days, compared with the average of 96. The figures are for the same variety of barley at the plant breeding station near Trondheim for a period of 20 years.

I spent two months in Troms in 1948. It was a most interesting summer. Temperature and precipitation are shown in Fig. 3. When I arrived at the beginning of June, both potatoes and grass were in very active growth because of the high spring temperatures. During the next two or three weeks the grass did not grow at all and the

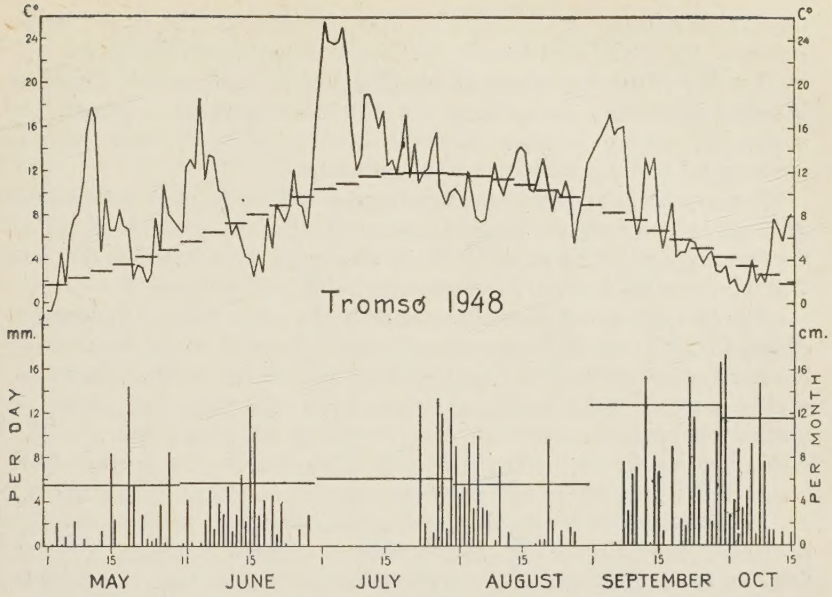


Fig. 3.—The daily temperatures at 2 p.m. and the daily precipitation in 1948 in Tromsö at 69°39′ lat. N. and 102m. above sea level, together with five-day means of temperature and monthly means of precipitation for the period 1901–30.

potato leaves partly lost their fresh green colour. The end of June witnessed a marked rise in temperature, and during the next 10 days, when the temperature in Troms was higher than in the greater part of southern Norway, an explosive growth took place. Such cold and hot periods occur in most years and are due to the advance of different air masses, the cold periods to Arctic air from west or north, the hot periods to warm air masses from the south-east. The plant breeding station at Tromsö announces that the flowering of the grass, which is mostly used here, immediately comes to an end when the wind turns from the south-east to west or north, and does not continue until the south-easterly winds prevail again. As far south as the Trondheim region the peasants say that dry hay and ripe grain is conditioned by the same weather type. I wish therefore to emphasize the different temperature requirements of plants harvested during their vegetative stage compared with plants which we cultivate for seed.

From an agricultural point of view the length of the growing season and the amount of heat at the disposal of the plants during that period are far more important than the mean temperature for July.

Fig. 4, which shows the temperature curves for four selected stations, based on five-day means gives some idea of the differences arising from difference in altitude, latitude and distance from the sea. Alta is situated in Finnmark at 69° N., Dombås in the upper part of Gudbrandsdal at 640 m. above sea level, but at a much lower latitude. Klepp and Hamar, to the right on my diagram, are situated at

approximately 60° N., the former close to the sea, the latter in the interior. They are representative of our best agricultural regions.

I will not use the space at my disposal to explain the difference between those two stations, as the difference between a longer, but somewhat cooler oceanic summer and a shorter, but warmer continental one is a well-known phenomenon.

A comparison between Alta and Dombås will be far more interesting, as it may give an answer to the question whether the natural conditions for farming are better at sea level in Finnmark than between 600 and 700 m. above sea level in the mountain valleys of southern Norway.

The two selected stations have excctly the same mean July temperature, 12·2° C., and the same annual range. Because of the situation at the head of an ice-free fjord, and the long days of the northern summer, giving a small daily range of temperature, the frost-free season is almost one month longer at Alta, totalling 111 days, whereas the corresponding figure for Dombås is 87 days, due to the greater daily range in temperature of this more continental and high lying station.

In the far north killing frosts in spring occur very seldom, because of the late beginning of the growing season, whereas damaging frosts in autumn are as frequent in the northern lowland as in high altitudes in the interior of southern Norway. The shorter days in September at the end of the growing season in the far north give a greater daily range of temperature than in June at the beginning of the growing season.

In spite of its shorter growing season, Dombås has definitely the better climate for agriculture of the two stations as all totals for heat, except that for the frost-free season, show higher figures than for Alta. It will not appear from my temperature diagram established on the five days' means. There is, however, reason to believe that the higher temperature intervals are of greater biological value than the lower ones, and that the growth of the plants is mainly due to the temperatures occurring during the warmest part of the day. As the more continental station of Dombås has a greater daily range of temperature than Alta, I should have preferred to use the temperatures observed at 2 p.m. on my diagram if such means had been available. In that case the superiority of the climate of Dombås compared with that of Alta would have been obvious, other climatical factors than temperature being eliminated.

When considering the yields of timothy and, in good summers, of barley at well-managed farms in the far north, some of our research people are inclined to believe that the light itself is a factor of plant growth. Others think that a natural selection of fast-growing species gives a sufficient explanation. Research concerning the influence of day-length at different latitudes is still in its infancy. I only wish to call your attention to the fact that the first cut of timothy at 69° N. exceeds that of eastern Norway both in quantity and quality, its protein content being higher. The greater yield may be explained by lack of rain in Eastern Norway, as the far north cannot compete with wet

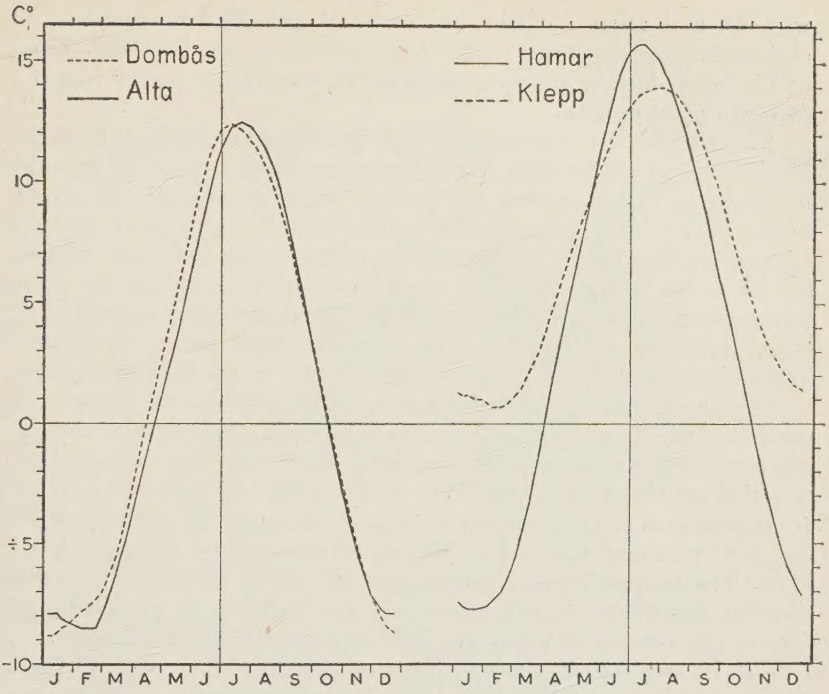


Fig. 4.—Seasonal variation of mean temperature for Alta (lat. 69°58′ N., 7 m. above sea level), Dombås (65°5′, 643 m.), Klepp (58°48′, 14 m.), and Hamar (60°48′, 139 m.), based on five-day means for the period 1861–1920. The average continuous frost-free season amounts to 111, 86, about 200, and 132 days respectively.

western Norway in respect of the quantity of hay. The quality is, however, unrivalled and must be explained in some other way.

On Figs. 2 and 4 I have only used temperature means. At the altitudinal and latitudinal limits of agriculture the variations about these means are, however, more important. As for the whole of Norway the temperature varies more in June and July than in August and September, but the size of the variations does not differ noticeably between northern and southern stations.

Even small negative departures from the mean may, however, be fatal. At the plant breeding stations near Tromsö, the grain did not ripen in three of the last twenty years, and no grain was sown in one year. The grain is sown in Tromsö about May 23rd.

In most countries the high temperature cannot be fully utilized by the plants on account of the lack of precipitation. This applies also to eastern Norway. In all years the yield in grass on the coastal plain of Klepp will be higher than that at the interior plain of Hamar; in many years so also will the yield in grain, because of the greater precipitation at Klepp, which has the better climate for grass, oats and roots, whereas Hamar has the better climate for grain.

The annual precipitation is shown to the right on Fig. 2. In the

western, and warmer of the two areas of rain-shadow appearing in eastern Norway appearing on this map, most farms are irrigated. Even in Finnmark lack of precipitation may in some years be the limiting factor in plant growth.

The distribution of this rather high annual precipitation is far from ideal. Even in wet western Norway you may have a period of drought in spring or early summer and in most years it will rain too much during harvest time, reducing the quality of the hay, the principal crop of these western farms, and raising the requirements in labour, all hay having to be laid by hand on wires stretched between poles. New techniques may help on this point. An artificial hay dryer on each farm is our ultimate goal, utilizing the summer flood water, which our hydro-electrical power stations cannot fully put to use in normal years.

Excess of rain is thus Norway's main problem in respect of precipitation. The necessary water to compensate its shortage in early summer in some minor regions can always be found. The precipitation recorded at the weather stations of the Otta valley north-east of Jotunheimen is not representative of the vast mountain regions which feed its rivers and which, in addition, is increased by the melting of snow. The disappearance of some minor snowfields, owing to the recent climatic improvement, will necessitate the building of more storage dams. The amount of water available is, however, quite sufficient.

I have emphasized the shortness of the growing season at high latitudes or altitudes. The period for preparing the soil for sowing also shortens with increasing latitude or altitude. All work has to be done in a greater hurry than further south. The easiest way to tackle this natural disadvantage is long leys, resulting in low yielding pastures, overgrown with moss. Well managed small farms with shorter leys and more arable crops need therefore a mechanical equipment out of proportion to their size, increasing their cost of production in an unpleasant way.

Because of the shortness of the agricultural year it is a great disadvantage if the sowing of grain and the planting of potatoes is delayed by frozen soil or snow. In regions of low winter precipitation hard frost may occur before the ground is covered by snow. The wind may also blow it off, causing the freezing of the soil to great depth and retarding its thawing in spring. In some regions wooden snow breaks are placed in the fields to stop the drift of the snow.

In regions with much snow in winter its melting in spring will delay the tillage of the soil. In such regions you may see the birches with the leaves full out on snow-covered fields having only a small ring of open earth around the trunk. In the valleys north of the Svartisen glacier at the Arctic circle the agricultural year starts one or two weeks earlier than in those to the south of the glacier, because of the difference in precipitation, the former being to some extent sheltered from the prevailing wet, south-western winds.

I will add a few words on the regional aspect of the well-known recent improvement in climate. The main fact to which I will call your


Fig. 5.—The larger areas of land emerged in late- and post-glacial time in Southern Norway (black), and Cambro-Silurian shales and limestones above the upper marine limit (ruled). The main mountain area (above 1,000 m.) is enclosed by a black line. The small scale of the map precludes any representation of the emerged areas between Kristiansand and Smöla.

attention is that the rise in temperature increases with latitude. The rise of temperature in winter is unfortunately of greater magnitude than in summer. In northern agriculture the higher temperatures in spring and autumn, however, lengthen the short growing season. The height limit of agriculture in southern Norway may have been raised say from 150 to 200 m. At the same time precipitation has risen about 10 per cent. We are anxious to know whether this warmer climate will last or even improve still more. Nobody knows.

In respect of climate the most salient phenomenon about Norwegian agriculture is the short summer resulting from the high northern latitude ; in respect of soil it is its absence over vast areas. The Quaternary glaciers have scratched off the soil cover, and the short time since their withdrawal, about 10,000 years, is inadequate in a country of cool, temperate climate, for the formation of a new residual soil except in areas with rocks which weather easily. Such rocks are not common in Norway, and we consequently worry less about the quality of soil than about its quantity. When considering the scarcity of soil and the large areas at altitudes which are too high for agriculture, you will understand the reason why the arable land of Norway occupies only 3 per cent. of the total land surface.

Most farms in southern Norway and almost all farms in northern Norway are found on former sea bottoms emerged in late- or post-glacial time. Extensive areas of such marine clays and sands with a great concentration of farms are found in front of the terminal moraines which have been accumulated at the end of the Ice Age. Behind them is mainly forest land, the ground moraine behind giving a satisfactory soil for coniferous forests, but being in most cases either too stony or not deep enough for the plough.

The larger areas of land emerged in late and post-glacial time in southern Norway are shown in black on Fig. 5. At Bergen the emergence amounts to about 50 m. ; in the inner parts of Hardanger it ranges between 100 and 150 m. ; and on the Ringerike plain north-east of Oslo, about 200 m., or between 600 and 700 feet. Above these altitudes we cannot expect to find big accumulations of sediments and extensive farming regions. The varying upper marine limit thus fixes in a striking way the height limit of the cropped land.

In western and northern Norway the area emerged is in most cases too small to be shown on a map on this scale. Nevertheless the majority of the farms are also here found on marine terraces in the lower part of the valleys and on alluvial fans along the steep fjord sides. On the coast and around the islands you will find them on the strandflat (the low brim of land found almost everywhere around the high, inner part of the islands and the coast) if the glaciers have left any soil or bogs have been formed since the withdrawal of the ice.

The strandflat is more or less developed according to local conditions, but in most cases you will only find one row of settlements, as you will see from Fig. 6, which shows the strandflat in Vesterålen north of Lofoten. The old farms are found on raised shore ridges, which


Fig. 6.—Hadselöy and parts of neighbouring islands at lat. 68° N. Contours at 50m. intervals; farms and small holdings are shown by black squares, other houses by black triangles.

offer dry building ground and have often extensive bogs behind them. In recent times some of these bogs have been cultivated, as other cultivable soils in most cases are not found. Whether the bogs can be cultivated depends on their type and the possibilities of drainage.

Only in eastern Norway will you find a greater number of farms above the upper marine limit, as in the great valleys of Endbrandodal and Osperdal. Their bottoms consist mostly of coarse alluvium, which may be flooded each summer as in the lower part of Gudbrandsdal shown on Fig. 7. On the two alluvial fans with their bad soil, as well as on the top of the cultivated hill-side, are found cotter's allotments and newer small holdings, whereas the old, bigger farms have, as usual, a midslope situation on the better soil, consisting mostly of ground moraine, here derived from softer outcrops on the hill-side.

Larger continuous areas with good farmland above the upper marine limit can, however, only be found in areas with Cambro-Silurian shales and limestones. As you will see from Fig. 5, such rocks occur over vast areas in high altitudes in southern Norway. The rich mountain pastures of eastern Norway are due to these rocks. At lower altitude they only occur in small areas, which have sunk between fault

lines. There we have some of our best agricultural regions, as at the large lakes north of Oslo, particularly Mjösa. The bedrock of the rest of southern Norway consists of Permian or Caledonian eruptives, Eo-Cambrian sandstones, or Pre-Cambrian schists and granites, all of them giving a very poor soil. In northern Norway and in the Trondheim region on the contrary, these Cambro-Silurian shales and limestones occur over large areas, both at low and high altitudes, but here climate puts a very low height limit to agriculture and most farms are found below the upper marine limit. I may therefore conclude this part of my paper by saying that Norway would have an important agriculture if southern Norway had the soil of northern Norway or northern Norway the climate of southern Norway.

We have no soil erosion in Norway. On sandy shores exposed to strong winds we have succeeded by planting to fix the sand dunes, which during periods of stormier weather formerly invaded the adjacent farms. Flood control is of course necessary in a country with great precipitation and vigorous relief, particularly if regulating lakes are lacking, as in some of the rivers having their outlets near Trondheim. At long and irregular intervals flood catastrophes occur also in the eastern valleys when intense melting of the snow and heavy rain combine, as in 1789 and on a smaller scale in 1938. In Hardanger an ice-dammed lake periodically empties itself by breaking a new outlet at lower altitudes, destroying farmsteads and cropped land in the valley beneath. The last catastrophe occurred in 1937, the previous in 1893. At still shorter intervals an immense stone slide occurs at Lake Loen in Nordfjord, creating a flood wave which has several times destroyed the few small farms on the opposite side of the lake. Other catastrophes occur more frequently, e.g., land slides in the clay areas round the Oslo and Trondheim fjords. The topography along riverside and fjord in these regions can only be understood by the action of such land slides.

I mention these well-known phenomena as both land forms and soils in Norway are young and will not reach a mature stage for a long time. The fine material brought down by melt-water and rain on the steep slopes of the inner fjord districts in western Norway add fresh mineral material to the soil each year. On the other hand the frequent occurrence of land and snow-slides is a hindrance both to settlements and to farming, in some cases even to the moving of cattle to mountain pastures.

The stone and snow-slides in mountainous western Norway have brought me to the third and last part of my paper, topography.

Nature has improved the climate, man the soil. Since 1900 our arable land has increased by more than 20 per cent., as has our population, whereas the output has increased by over 40 per cent. New methods of drainage have led to the cultivation of bogs, cheap artificial manure has turned poor heaths into cropped land. Our peasants no longer worry so much about the quality of their soils ;

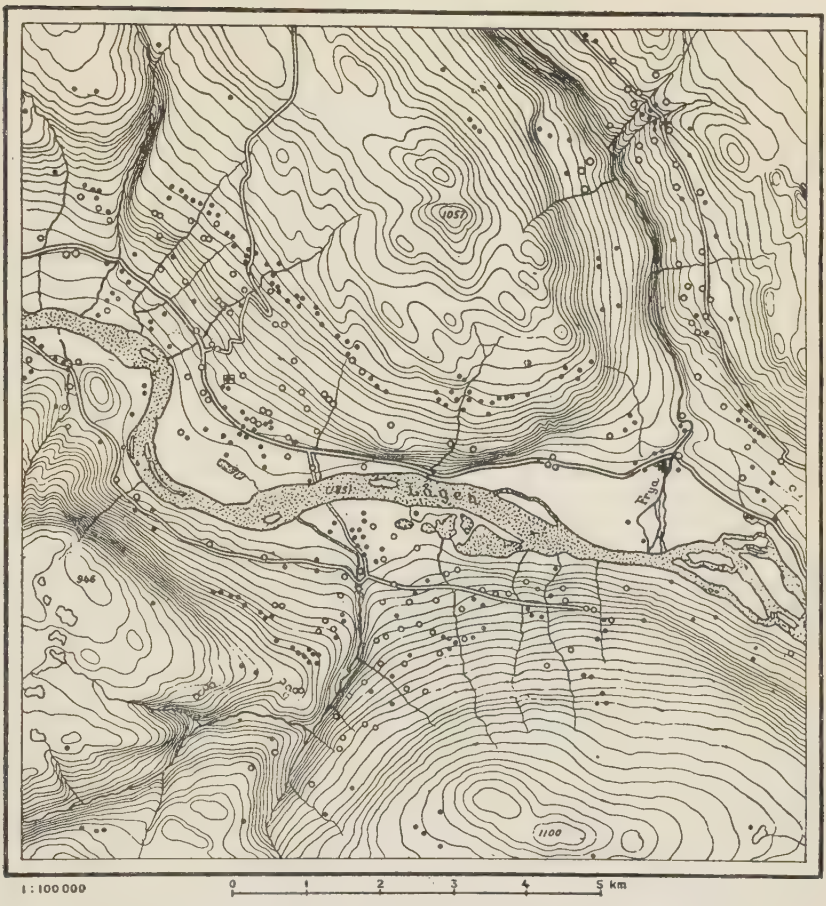


Fig. 7.—A part of lower Gudbrandsdal. Contours at 30 m. intervals. Settlements and roads are from the middle of the last century when the siting of the settlements was determined by natural factors to a greater extent than now. Farms are shown by open circles, cotters' allotments, small holdings and seters by filled black circles.

topography is now of greater importance to them. The new agricultural machinery requires level land and larger farms than are usual in Norway. Over large areas, however, nature puts a very narrow limit to the use of modern machinery. Farms situated above the upper marine limit often consist of a great number of small patches of arable land separated by rocks either at surface or at small depth. Or they may have their fields on slopes which are too steep for ploughing. New techniques may help on this point. Some peasants now try cable ploughing. The plough and the harrow are hauled straight up the hillside by an electric motor thus substituting the earlier downward movement of the soil by an upward one. Life on such farms will, however, be too troublesome and require more labour than can be found now, and a great number of them will probably be disused in

spite of our subsidizing them heavily. They never had any importance for the food supply of the nation, which must mainly be drawn from the lowland areas of good soil and relatively level land.

Norway has, however, only small amounts of such level land. You may believe that the emerged marine sand and clay will be level land. We have indeed large level areas of poor sandy soil covered by pine forest. It will, however, in most cases prove to be too expensive to turn them into farm land. The clay areas with their fairly good soils are far from being level. The rain water gathers in streamlets at their almost waterproof surface and furrow it in all directions, whereas the porous sand lets the rain-water through. You can, in most cases, plough these dissected clay areas, but not at the same speed and cost as a real plain. The same applies also to the districts which have Cambro-Silurian bedrock. The rather thick morainic deposits of these regions have only slightly smoothed the corrugated character of their ice-eroded rock surfaces.

In other respects the hilly character of Norway proves to be an asset. In a country of prevailing podsol profiles you may find on slopes fine brown earth profiles. The steady flow of nutritious ground water from above gives a rather rich soil, which in western Norway over large areas is covered by alder scrub. Bacteria living on its roots fix the nitrogen of the air. These slopes are admirably suited for spruce forests. Recently our agriculturists have revealed the suitability of these soils for grass, which, like spruce, never gets enough water and does not need high summer temperatures. It can, however, not pay to cut the grass on these steep slopes ; we have to harvest them by grazing.

The temperature is high on a south facing slope because of the angle of the sun rays, and it is a great handicap to be situated in the shade of another mountain several hours in the morning or the evening. We have many such valleys in Norway, and particularly at high altitudes you may find all farms in the sunny slope, whereas the opposite side is occupied by " seters," only used for grazing throughout the summer months, or it is left in forest. During winter, this side of the valley may be sunless during several months.

This brings me to my final conclusion.

Climate is far from ideal, owing to the high northern latitude, but has improved in recent time, in any case temporarily. Soil is absent or too shallow over vast areas having a fairly good climate. Its quality is mostly poor, but is now more or less under our control. Relief will, however, always be a serious handicap to agriculture in Norway.

# BETWEEN THE TASMAN SEA AND THE BLUE MOUNTAINS

S. R. Eyre*

THE student of climatology is often frustrated by the absence of local weather studies concerning a particular area in whose climate he is interested. The standard text-books provide him with an account of the dominant air masses and pressure systems over the continent concerned, along with temperature and rainfall data from a thin sprinkling of weather stations. Little attempt can be made within the scope of such works, however, to give the reader a clear picture of the actual weather experienced throughout the year at individual stations, and still less to relate the local weather phenomena to pressure systems. As a result of this the student commonly finds it impossible to visualise weather as an integral part of the geographical landscape ; it remains in his mind as a list of figures bearing little relation to reality and not comparable with weather he himself has experienced in his own country. Our British view of Australian weather is a case in point and it is hoped that this short account of the yearly sequence of weather in the New South Wales coastal plain will help to clarify the reader's picture of the landscape in this economically important part of Australia. An effort has been made to correlate weather observations made at Schofields Airfield (Fig. 1) and in the Sydney area with pressure systems migrating across the continent towards the Tasman Sea. The nature of these pressure systems is well known but a short statement of their main characteristics will give the reader a better appreciation of the local phenomena whose description follows.

Migrating anticyclones cross Australia from west to east, their circulations extending northwards just beyond the tropic in summer but frequently covering almost the entire continent in winter. Only the northern extremities of Arnhem Land and Cape York Peninsula are covered permanently by the equatorial low. Nevertheless the centres of these migrating systems rarely move north of parallel 27°S while they are over the continent.

The typical V-shaped depression of the North Atlantic area is unknown in Australia. Such depressions are formed by the intrusion of warm air from over the North Atlantic Drift into cold polar air and consist of warm fronts followed by cold fronts with intervening warm sectors. The exact process of frontogenesis in the Australian region is as yet not fully understood but whatever the process may be the resultant pattern of fronts is very different from that in the Northern Hemisphere. During a whole year's observations near Sydney not a

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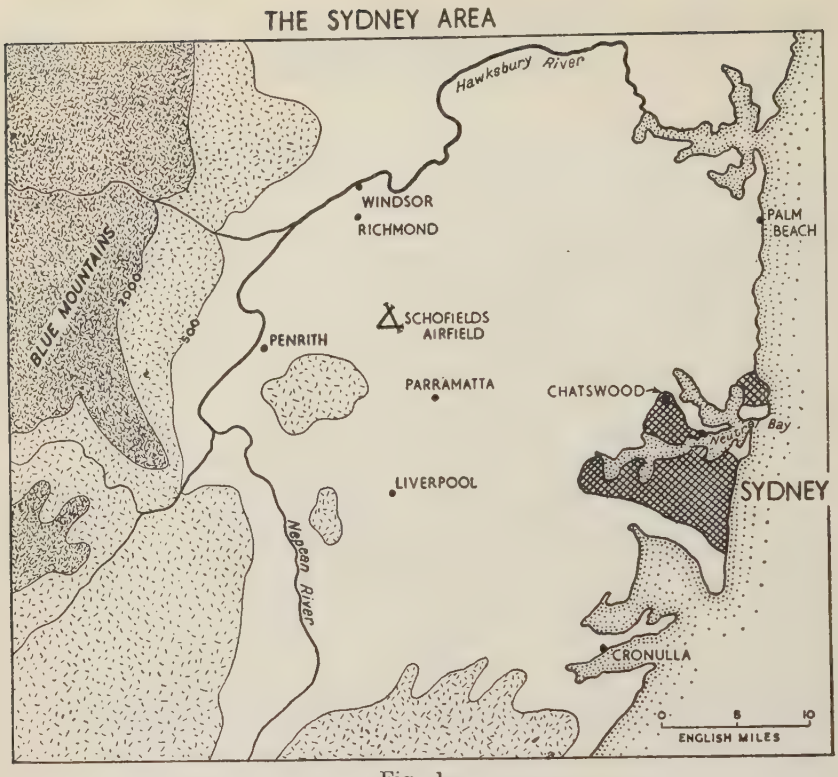


Fig. 1.

single warm front was seen to cross the area. The typical Australian cold front can be regarded merely as the product of two interacting anticyclones. (Fig. 2).

The succession of anticyclones separated from each other by cold fronts proceeds with monotonous regularity and along huge stretches of the southern coast of Australia such as the Nullabor Plain a regular succession of different types of weather recurs with almost clock-like precision, particularly in the summer months. After the passing of each cold front a cool south-westerly wind blows in from the Bight. This veers slowly to the N.N.W. becoming hotter and hotter as the centre of the anticyclone passes and the next cold front approaches. Then with a heavy squall and perhaps a slight shower the front passes and the wind backs sharply to the south-west to begin the cycle again.

This simplified succession of weather does not occur, however, in the New South Wales coastal plain. Here the north-south trend of the coast and the sheltering barrier of the Blue Mountains create an intricate meteorological balance so that a slight change in the direction of the gradient wind can give sweeping changes of weather within a very short time. With a southerly wind blowing parallel to the coast calm and cloudless weather may prevail over the coastal plain while a few miles out to sea there is continuous rain and drizzle. If the wind

shifts slightly towards the east weather over the coastal plain deteriorates rapidly. In summer thunderstorms may rage for hours over the mountains or over the sea while fine weather persists unbroken over the coastal plain. Again, fronts moving from west to east may cause heavy rain in the mountains but give only a short period of cloudiness as they cross the plain. Thus special weather phenomena are observed in all seasons within this limited area making it one of absorbing interest for the meteorologist.

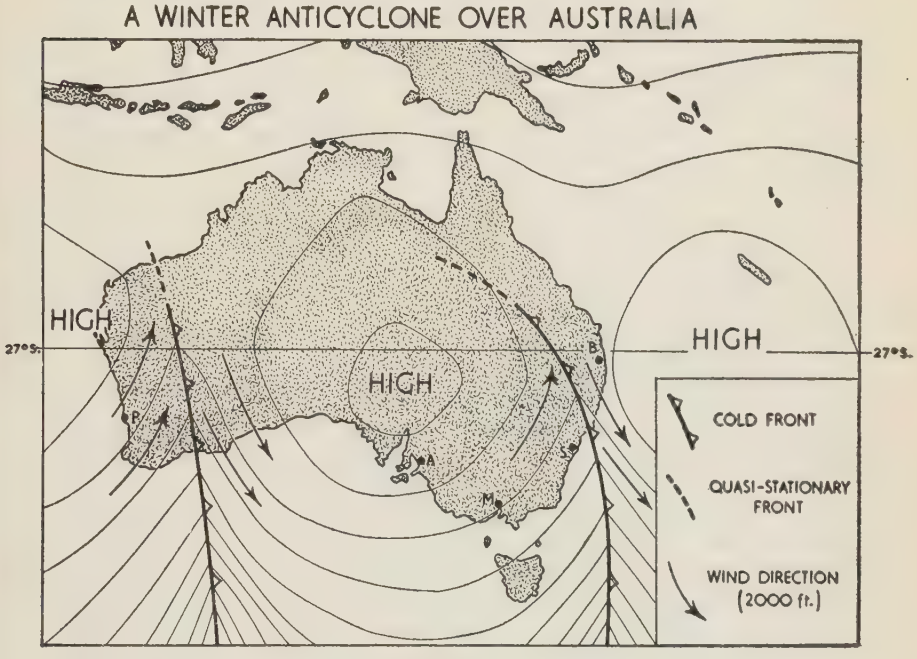


Fig. 2.

### Summer Weather Conditions

The hot north-westerly gradient wind blowing in the rear of a summer anti-cyclone is the air stream which is least modified by the factors of position and relief, though its heat must be slightly intensified and its humidity even further lowered by the 3,000 ft. descent down the eastern slopes of the Blue Mountains. This continental air gives heat waves alike to Sydney, Melbourne, and Adelaide, afternoon temperatures at all these stations soaring to well above the century when the north-westerly is well established. Because of this north-westerly wind the Sydney area frequently experiences much higher day maxima than the Queensland coastal plain ; day after day temperatures may exceed 100° F. on the New South Wales coastal plain while around Brisbane they barely reach 90° F. At Schofields the highest air temperature recorded during the summer of 1945–46 was 115° F., this being a reading taken under standard conditions at 3 p.m. during the first week in January. A maximum sun temperature (taken with a black bulb

thermometer half an inch above ground level) of 142° F. and a minimum relative humidity of 17 per cent. were recorded on the same afternoon. During similar heat waves in the same season temperatures at Schofields frequently rose to between 105° F. and 110° F. with accompanying relative humidities of between 20 per cent. and 30 per cent.

The effect of such periods of intense heat upon this area, underlain for the most part by permeable Triassic Sandstone, is devastating. Apart from the banks of streams and garden lawns green grass is never seen during the five or six summer months. Beneath the gum trees in the remnants of original woodland undergrowth is completely absent and the bare earth is everywhere infested with ants. The rate at which water can disappear from the surface by evaporation and percolation is amazing ; a few hours after a thunderstorm which has turned sandy tracks into swirling torrents the dust again begins to rise in clouds in the wake of both vehicles and men.

In Sydney itself the afternoon air temperature during periods of extreme summer heat is usually as much as 10° F. below that at Schofields. While temperatures of 105° F. to 110° F. are frequent a few miles from the coast, around Sydney Harbour they are very rare indeed. Residential suburbs such as Neutral Bay which slope down to the water's edge on the north side of the Harbour and the heavy engineering industrial area of Cockatoo Island and the dockside all have relatively moderate temperatures owing to the inflow of cooler air from over the waters of the Harbour. Quite short distances from the sea, however, are sufficient to reduce this maritime effect to negligible proportions and even in some of the more inland suburbs such as Chatswood, only two or three miles from the Harbour, temperatures rise to 100° F. much more frequently than in the city.

The lower temperatures in Sydney do not necessarily indicate less human discomfort there during a heat wave, however ; the higher humidity of the maritime air often counterbalances the advantage of its lower temperature. It is only on beaches facing the open ocean (of which the Sydney area has many) that one can find relief from the excessive heat brought by the north-westerly. Here the sea breeze is sufficiently strong even in the face of a strong westerly gradient wind to keep the beach sand relatively cool and to lower the air temperature so that it approximates to the sea temperature. It must be realised, however, that the recognisable sea breeze may extend only a few hundred yards inland against a strong wind in the opposite direction so that only a very narrow zone along the coastline benefits from it.

At weekends during heat waves, therefore, a large proportion of the city's population transfers itself to this narrow strip of land extending from Cronulla on the Port Hacking inlet in the south to Palm Beach 15 miles north of Sydney in the north. This mass movement to the beach is essentially different from parallel movements to the seaside in England. In our own country the main motive is to obtain a change of air and scene but in Sydney it is primarily a movement to escape from an enervating heat which endured too long can become deleterious for

many white people. In England a weekend in the country is an alternative of almost equal merit ; in Sydney the suggestion of a week-end in the country during the summer would hardly be taken seriously. Country relations are vouchsafed social visits only in the winter half of the year.

The yellow dust haze brought by the north-westerly to the coastal plain may shroud the sky from sunrise to sunset. This haze intensifies during the day when the wind at the surface of the earth is strengthened by increased convection and the sun may be completely obscured two or three hours before sunset. A particularly bad dust haze of this type occurred during January, 1945, and showed very clearly how efficient this dry west or north-west wind is as an agent of soil erosion. During the preceding year the wheatlands of the Riverina and other parts of western New South Wales had been desiccated by an abnormally long drought ; then, at the end of December, an anticyclone became almost stationary over the north-east of the state and for a fortnight a continuous westerly wind swept over the plains. The combination of strong convection currents and persistently north-westerly wind conveyed large quantities of the surface soil into the upper troposphere and then eastwards. For almost a week the sky over the coastal plain was shrouded in a thick reddish haze which the sun rarely penetrated even at midday. In Sydney, house interiors were thickly coated with dust within a very short time and even in New Zealand, 1,200 miles to the east, a marked haze persisted for several days. Such persistent weather is doubtless of rare occurrence but it illustrates what must be happening on a smaller scale whenever the westerly blows.

Heat waves in the coastal plain are sometimes terminated by the passage of a cold front which approaches from the west and consequently has first to pass over the Blue Mountains. As this front passes the wind backs sharply from north-west to south-west and the temperature drops noticeably. A brief period of cloudiness and possibly a slight shower accompany the passing of such a front but heavy rain or thunder rarely occur owing to the dryness of the interacting air masses.

More typically, however, the front that brings the cooler conditions to the coastal plain advances from the south—the familiar " Southerly Buster " as it is known to the inhabitants of Sydney. The direction of this wind and the orientation of the front are the result of the retardation of the trailing continental end of the front over the dry surface of the continent with relative acceleration over the ocean to the south. The barrier of the Blue Mountains may also be effective in holding back the advancing front over the land (Fig. 3). The very marked coastal bulge in the front develops during the daytime, however, and it would appear that the existence of a sea breeze over the coast can account for this. Air over the land becomes heated and rises to be replaced by cooler air from over the sea. The much colder air advancing from the south will in turn tend to be drawn in to replace the latter and a forward bulge will develop in the front.

It will be appreciated that a most complex isobaric configuration must result when a front becomes so contorted and since the front is moving from south to north the wind behind it will tend to strike the coast from a south-easterly direction (Fig. 4). The wind shift as the front strikes is considerable ; often the wind backs from west right round to south-east. We thus have the peculiar situation of a cool change initially advancing across the continent from the west actually striking the coastal plain as a south-easterly squall.

During the night following the active portion of the front moves away over the Tasman Sea towards New Zealand while the northern continental part drifts slowly towards the coast. Owing to strong surface heating over the land mass this portion rapidly becomes a very weak quasi-stationary front and is often caught up in the circulation of the advancing anticyclone ; here it dissipates rapidly.

Being in an open, exposed situation, Schofields Airfield receives the full force of these line squalls and is an excellent vantage point from which to view their form and rate of movement. The approach of a southerly is not spectacular until a few minutes before it actually strikes and quite frequently synoptic reports are the only means of knowing of its proximity. Many of the most violent fronts are preceded by a period of suspiciously complete calm in which the north-westerly, which may have been blowing with an average force between ten and fifteen knots for several days, dies away or becomes a mere gentle drift through which the smoke rises almost vertically. Usually a continuous belt of towering cumulus can be observed on the south-eastern horizon for one or two hours before the front strikes. Since the tops of these cumuli only form, however, at a considerable distance behind the intersection of the front with the ground, their distance from the observer gives no real indication of the proximity of the squall.

The squall is often heard before its effects are seen. A faint whispering disturbs the almost eerie stillness of the preceding calm and this gradually resolves itself into the sound of distant wind. Then above the tree tops to the south-east a wall of dust appears towering up to a height of several hundred feet with isolated spirals rising even higher. This advances until the intersection of the front with the ground appears a few hundred yards away on the perimeter of the airfield. The gum trees suddenly bend over like whips only to be obscured almost immediately by the dense dust barrier.

It is extremely difficult to make weather observations during the passing of such a front ; indeed one risks minor injuries in attempting to do so. Pieces of wood, hard pieces of earth, small stones and all kinds of litter are picked up and whirled along by the wind which for a few minutes may exceed a speed of forty knots. Visibility may be reduced to twenty or even ten yards. The accompanying fall in temperature is most abrupt ; immediately after the passage of a southerly in mid-December, 1945, the thermograph at Schofields showed a fall from 97° F. to 72° F. in less than a minute with a farther fall to 63° F. during the following ten minutes. During the same time the relative humidity

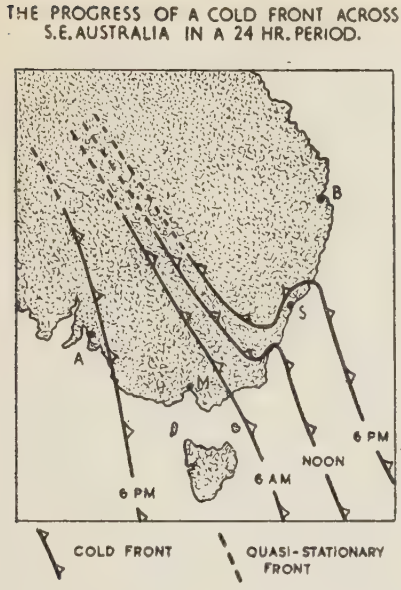


Fig. 3.

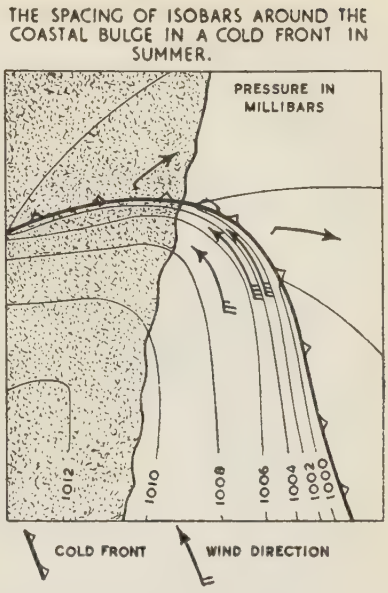


Fig. 4.

rose from 26 per cent. to 70 per cent. and the barograph trace showed a remarkable " kick " rising three or four millibars in a few minutes. Such a rapid rise bears witness to the very steep pressure gradient behind the front (Fig. 4). The barometer continued to show a rapid rise during the next twelve hours as the high pressure conditions of the succeeding anticyclones were established over the coastal plain.

In summer the extent and strength of the sea breeze over the coastal plain are obviously important factors in creating minor differentiations in local climate. The advent of cooler air from over the surface of the sea on a hot afternoon in January is frequently appreciable without the aid of meteorological instruments. On the Sydney beaches, as has already been explained, the sea breeze is strong enough to give considerable relief from the heat but farther inland the greater humidity of the maritime air militates against its comfort value. The effects of the sea breeze and its extent over the coastal plain can be studied very satisfactorily from Schofields.

The aerodrome is unfortunate in that between November and April it occupies a position which is frequently at the extreme landward limit of the sea breeze. Consequently on a summer's afternoon when the gradient wind is weak very variable wind conditions result ; indeed the writer has frequently observed a gentle easterly breeze blowing at the eastern end of the airfield while the westerly wind prevailed at the western end. On such an afternoon each air stream prevails over the other for a while and then gives way again so that both hygrograph and thermograph oscillate vigorously as hot, dry continental air and cooler, damper air from over the sea alternately hold sway. Both easterly and westerly are light so that serious danger to parked aircraft is never

entailed because of actual wind direction. The whirlwinds or willy-willies that develop along this local "front," however, are a very real danger. They vary in size from slender tubular columns of dust three to four feet in diameter to destructive circulations over 50 yards across rotating at speeds up to 50 knots. Owing to their limited size it is impossible to forecast just when a whirlwind will strike a particular point and parked aircraft are thus in constant danger on days when convection is strong. An almost continuous lookout is necessary. Whirlwinds do of course develop sporadically in any area where strong surface heating is taking place but their frequency along the landward limit of the sea breeze is marked.

### The Transition from Summer to Winter

The last heat wave generally occurs about the beginning of March when the tendency to low pressure over the centre of the continent decreases with the diminished insolation. The troughs which extend northwards over the land are thus shallower and the north-westerly winds blowing in front of them proportionately weaker. Between March and May the anticyclones extend further and further north and the continental air mass becomes cooler and cooler until by June its temperature is little higher than that of the south-westerlies which blow off the Southern Ocean over the south-east corner of the continent.

### Winter Weather Conditions

Most anticyclones approaching the New South Wales coastal area are preceded by a ridge which extends eastwards far ahead of the main centre of high pressure. In summer when pressure is low over the continent the centres of the anticyclones move along the south coast of the continent so that the ridges preceding them usually extend across Victoria giving an unstable south-easterly air stream over the New South Wales coastal plain (Fig. 5). In winter, however, with the anticyclones tending to follow more northerly tracks these precursory ridges may develop from west to east along any line between S. Queensland and S. Victoria. Weather forecasting in the Sydney area is much complicated because of this, since a ridge situated to the north of the city gives a gentle south-westerly wind with cool dry weather, while one to the south gives a south-easterly air stream which is very unstable and often brings protracted periods of rain. Only by a constant study of pressure tendencies over the whole of south-eastern Australia both at the surface and at higher levels can the meteorologist have any indication of the type of weather that will occur as the anticyclone approaches.

The New South Wales coastal plain receives the greater part of its winter rainfall from the unstable south-easterly air stream. Cold fronts crossing from the west certainly give more rain than they would in summer, but frontal rain rarely lasts for more than a few hours whereas days of continuous rain often occur with a south-easterly.

It is noteworthy that rain falls over the sea long before this south-easterly air reaches the New South Wales coast and this fact

A HIGH PRESSURE RIDGE OVER VICTORIA.

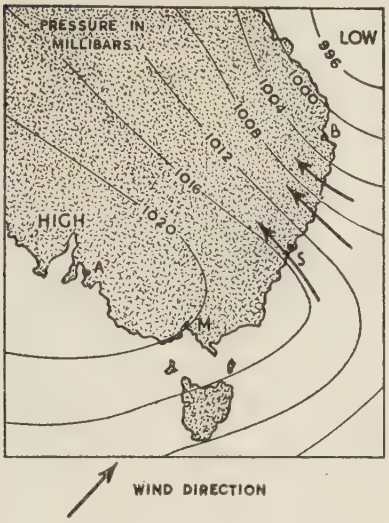


Fig. 5.

A RIDGE OVER S. QUEENSLAND IN WINTER.

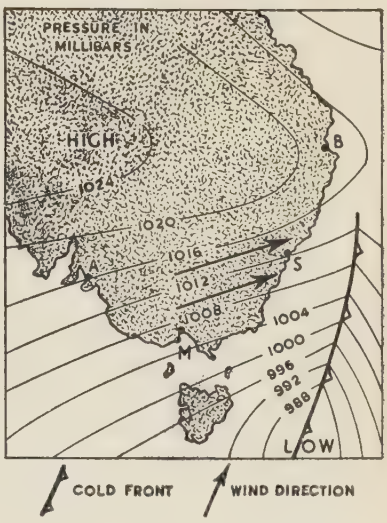


Fig. 6.

completely invalidates former explanations of its occurrence. We have long been taught that rain is caused within the anticyclonic circulation merely by the forced ascent of the air stream up the slopes of the Eastern Highlands. This factor, however, cannot explain the heavy falls over the coastal plain and even far out to sea ; other causes must be operating and though no final solution has been reached, it is likely that convergence plays an important part in causing ascent.

The approach of a tropical cyclone from the direction of the Solomon Islands towards the Queensland coast frequently coincides with the formation of a ridge in a southerly position (Fig. 5) giving a steep pressure gradient and marked convergence over the New South Wales coast. In July, 1945, with this isobaric configuration between 10 and 15 inches of rain fell within three days at several points in eastern New South Wales. Lismore in the north-east of the state had particularly bad floods and the Nepean River overflowed its banks at several points near Richmond (Fig. 1) and Windsor. Tropical cyclones such as this one are most frequent in the late summer but their centres rarely cross the Queensland coast ; usually they curve round to pass south-eastwards over Lord Howe Island and North Island, New Zealand. Of much rarer occurrence are the tropical cyclones which penetrate Queensland from the Gulf of Carpentaria and follow a south-easterly track across north-east New South Wales.

The wet chilly conditions brought by the south-easterly may fairly be considered as the most unpleasant weather experienced in the Sydney area. For several days the temperature may not reach 50° F., but the continuous cloud cover and strong wind ensure that there is little heat lost by radiation at night so that the minimum temperature

over the same period is usually above 40° F. The weather during such a spell is very similar to that experienced in N.W. Britain during a wet period in autumn. Indeed only at a time like this can the weather in Sydney lead an English visitor to imagine that he is back in an English city. The cold wind sweeps in from the sea driving great splashes of rain almost horizontally along the streets making them look very like the streets of Liverpool or Glasgow just before the passing of a strong warm front.

A much greater range of temperature is experienced when a ridge develops in a more northerly latitude and gives gentle westerly or south-westerly winds (Fig. 6). This air-stream originates over the Southern Ocean as does the south-easterly but its passage across the south-east corner of the continent with the final descent down the eastern slopes of the Blue Mountains lowers its humidity sufficiently to ensure clear night skies and only moderate cumulus development during the day time. Thick, towering cumulus over the Blue Mountains is often visible from Schofields, however. Maximum day temperatures above 65° F. are very rare indeed during the months of June, July and August in spite of long sunny periods.

With a clear atmosphere intense surface cooling takes place at night and frosts are frequent at Schofields. Temperature inversions of sensational steepness can be observed ; in mid-July, 1945, a minimum air temperature of 28° F. was recorded with a grass minimum of 23° F. on the same morning. Frost occurred on about twelve mornings during the winter of 1945 the temperature falling below 30° F. on several occasions. It must be emphasised, however, that temperatures below freezing point have never been recorded in the free air at altitudes between one and two thousand feet above the ground and consequently until the freak storm in the winter of 1949 snow had never been recorded in Sydney. Even in the mountains at heights of about 4,000 ft. around Katoomba and Lithgow snow falls but rarely and never lies for more than a few hours.

Situated as it is around the shores of the Harbour, Sydney experiences far fewer frosts than places only a few miles inland. On mornings with a south-westerly gradient wind in 1945 air temperatures at Mascot aerodrome in Sydney were consistently 5° to 10° F. above those at Schofields. At Schofields, indeed, one expects to find a thick hoar frost after a night's radiation at any time between the end of May and the middle of August, but there are limited areas around Sydney Harbour where hoar frost has rarely if ever been observed. Even at points in the suburbs some miles from the sea a frost is worthy of note as something that happens only once or twice a year.

Radiation fogs are also of frequent occurrence over the coastal plain varying from slight ground mists only a few feet in thickness to dense fogs 600 to 800 ft. thick. Conditions at Schofields are favourable for the development of a thick layer of fog because even when the pressure gradient is so slight as to give no appreciable air movement at the surface a slight katabatic wind from the Blue Mountains promotes a

gentle mixing of the lower layers of the atmosphere in the early morning creating the optimum conditions for fog formation. Even the thickest of these fogs dissipates between 11 a.m. and noon, however, and during a complete winter at Schofields not one was seen to persist throughout the day.

### The Transition from Winter to Summer

In the New South Wales coastal plain spring is a season with a recognisable character. It is the only time of the year when the grass and the gum trees may present those brighter shades of green which are so familiar to British eyes. At this season the accumulated moisture of the average Australian winter combined with the increasing insolation produce a climate which promotes rapid plant growth, whilst the sun is as yet insufficiently strong to desiccate the soil. Meteorologically, however, the spring is merely a gradual transition from winter to summer with the periodic north-westerly winds becoming stronger and stronger each time they blow. By the end of August night frosts have ceased and morning mists have become rare. This is no period of equinoctial gales, however, as in the parallel season in Britain ; indeed no characteristic meteorological phenomena can be associated with it in this area.

The foregoing account of weather in the Sydney area has of necessity been illustrated mainly by reference to the one station at which instrumental observations were made, though it is realised that the local climate of Sydney is of more general interest. Many of the phenomena described are certainly typical of the area as a whole but at Schofields an interesting local climate is produced by the blending of continental, mountain and marine effects. In Sydney on the other hand local contrasts are produced by the varying degree of penetration of air from over the sea due to the embayed nature of the coastline. As detailed and standardised statistics are available for very few points around the shores of Sydney Harbour much more research would be necessary before a complete analysis could be attempted. It is hoped therefore that the reader will excuse the somewhat qualitative and pictorial approach that has been adopted.

The writer does not pretend that this article gives an exhaustive account of the meteorological processes operating over the area concerned. The statistics at his disposal are very limited and Australian observers are doubtless in a much better position to write both technical and purely descriptive articles about Australian weather. Should any of them feel surprised that a relative stranger should have the temerity to tender such an article for publication it will be because they have not fully realised how few local and detailed studies of Australian climate are available to readers in other countries. Let us hope that in the near future the many Australians who are working in the fields of geography and meteorology will provide us with more and more of such studies and thus enable us to obtain an accurate picture of Australia as a whole.

# BRITISH GUIANA.

## 1.—COASTLANDS AND INTERIOR

G. Lighton*

### Historical

DIFFICULT conditions of swamp and forest on land, and natural obstructions in all the large rivers, made Guiana the principal gap in Spanish and Portuguese knowledge of the northern part of South America. The "Wild Coast"—the littoral of the region between Amazon and Orinoco—therefore provided a foothold for English, French and Dutch enterprise from the time of Raleigh to the Napoleonic wars. The coast from the Orinoco to the Maroni[1] was held by the Dutch for two centuries. The natural difficulties of penetrating the interior of what is now British Guiana were enhanced by a long-held policy of the Dutch colonial government which forbade settlement away from the lower reaches of the rivers, for the sake of defence and ease of control. But the small numbers of Dutch on the lower Essequibo were not willing or able to prevent a large influx of English[2] and French settlers, and when, about 1800, the fortunes of war put the British in command of the coast, the future of the colony was the more easily decided. English readily became the medium of speech, and scarcely a trace of Dutch is left in the present Guianese vocabulary[3]. Very few Dutch families remain. Hence, Georgetown, founded as late as 1783, owes little to Dutch influence. The lateness of this foundation is partly accounted for by the compactness of the earlier agricultural settlements on the lower part of the navigable Essequibo. There was no necessity for a central market since each plantation was largely self-sufficing in local produce and had its own wharf on the river; and the Dutch West India Company's ships called but rarely[4].

In the 17th century, fear of pirates and privateers had deterred efforts to improve the half-flooded coast lands. For long, the capital of the Colony of Essequibo was a small fort at the junction of the Mazaruni and the Essequibo, over forty miles from the ocean. When the lands of the lower Essequibo were all occupied, settlers, mainly English, colonised the smaller and hitherto neglected 'Rio Demerary.' The Colony of Demerara became the protégé of Essequibo, and the seat of government was moved to an island near the mouth of the Essequibo in 1740. By 1750 it was possible to give Demerara a separate Commander.

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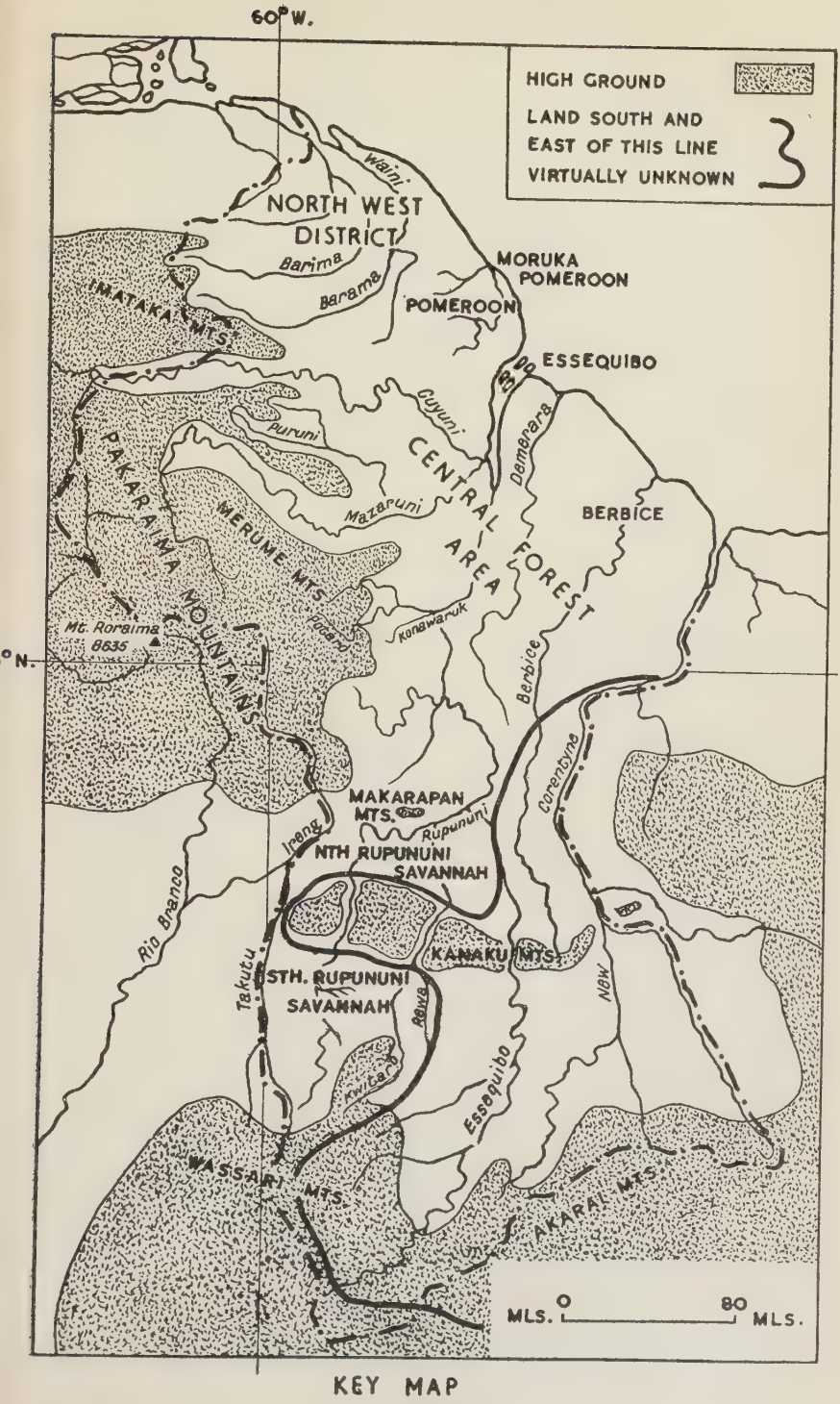
[1] The present eastern boundary of Dutch territory.

[2] The Pilgrim Fathers considered settling there.

[3] Wharves are still called "stellings" and sluices "kokers." The first newspaper, printed under the Dutch government, was in both Dutch and English. The law governing immovable property is still the Roman-Dutch Law "as administered by the courts." There are scores of Dutch place-names.

[4] Intervals of two years sometimes occurred.


60° W.
HIGH GROUND
LAND SOUTH AND EAST OF THIS LINE VIRTUALLY UNKNOWN
3
NORTH WEST DISTRICT
Waini
Barima
Baramo
MORUKA
POMEROON
POMEROON
IMATAKA MTS.
ESSEQUIBO
Cuyuni
Puruni
Mazaruni
CENTRAL AREA FOREST
Demerara
BERBICE
PAKARAIMA MOUNTAINS
MERUME MTS.
Mt. Roraima 8635
Kanawaruk
Berbice
Corentyne
MAKARAPAN MTS.
Rupununi
Ireng
NTH RUPUNUNI SAVANNAH
Rio Branco
KANAKU MTS.
Takutu
STH. RUPUNUNI SAVANNAH
Rewa
Kwitaro
Essequibo
NEW
WASSARI MTS.
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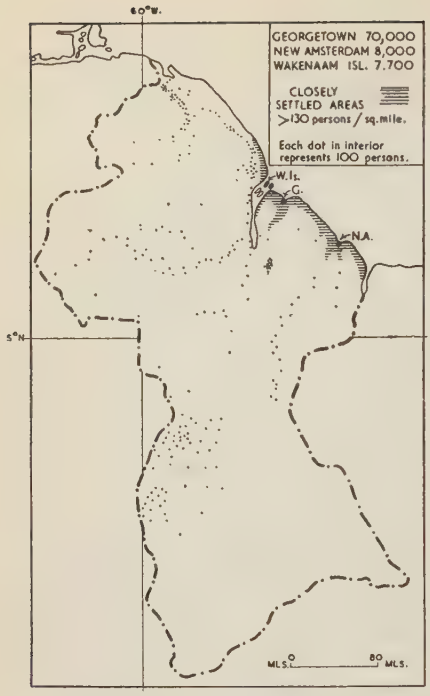
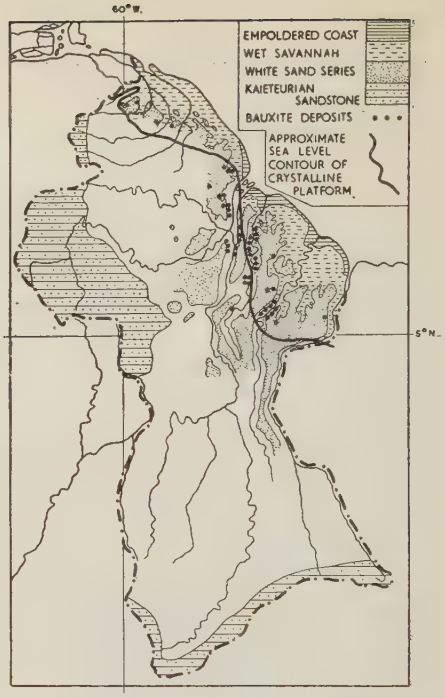
KEY MAP

Fig. 1.




DISTRIBUTION OF POPULATION

Fig. 2.




OUTLINE GEOLOGICAL MAP

Fig. 3.

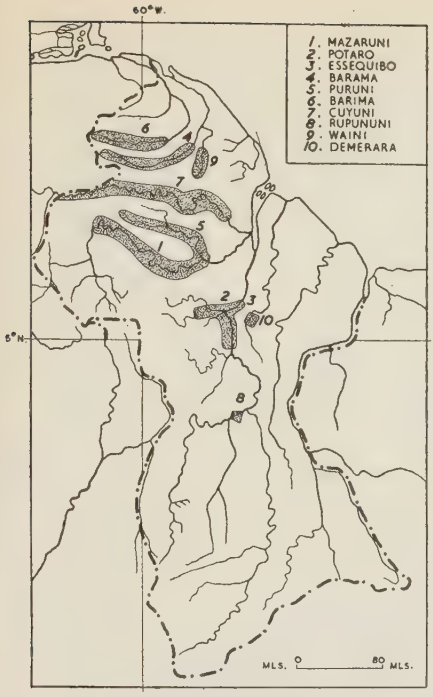
By 1760 there were 130 estates in Demerara. The first settlements on the river had been away from the sea, but in 1759 planters laid out the present site of Georgetown as coffee and cotton lands.

This move to the sea-coast was partly occasioned by population growth, partly by a veritable " shifting cultivation " system on a scale comparable only to that practised until recently in the coffee-growing districts of Brazil. Land was so plentiful that, when the initial fertility of the soil showed signs of exhaustion, a complete new estate of about 250 acres was commonly taken over and the old one abandoned.

It was from this point that Georgetown's existence became a possibility. Once the settlers took courage and began to improve the coast-lands, ships could no longer reach the private wharves of their estates because of the extreme shallowness of the sea, and a port became necessary. At the same time, the extraordinary fertility of the coast soils attracted the population of the riverside, and instead of three separated colonies on the lower Essequibo, Demerara and Berbice rivers, the present arrangement of a continuous, long, narrow, coast strip of population came into being. The rivers and hinterland were so little regarded thereafter that nine-tenths of the population now inhabits a mere tenth of British Guiana.

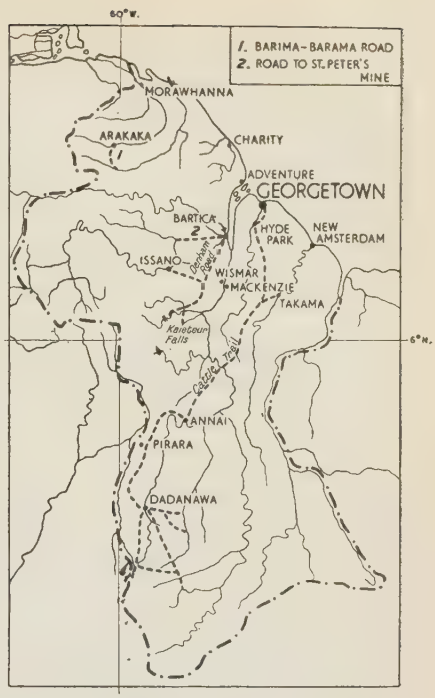
## Knowledge of the Colony

The colony is about the same size as Great Britain, and its main features are known in outline, principally from the researches of Sir




GOLD PRODUCING AREAS

Fig. 4.




FOREST COMMUNICATIONS

Fig. 5.

Robert Schomburgk in 1835–44, the geologists C. Barrington Brown and J. Sawkins in 1868–73, and the present Geological Survey.

The only areas about which more than the barest outlines are known are those indicated on Fig. 1. An enormous, presumably forested, area in the East and South is unihabited and almost impenetrable. Of the better-known areas, only one, the Rupununi savannah, has any access to the outside world save through the single ocean port of Georgetown[5].

In the following account, for names of rivers, mountains and districts see Fig. 1, and for names of towns and villages Fig. 5.

## The Guiana Coast

The alluvial coast deposits contribute most to the life of British Guiana (Fig. 3). They may first be considered as a whole, though human agency or neglect have made clear differences between various parts.

The ancient crystalline rock platform which forms most of the interior of the Colony dips gently but steadily northward, and reaches sea-level at points in general well inland from the present shore-line. Its seaward edge is partially covered by a formation of which the nature and importance has been recognised only recently. This is the "White Sand Series," a deposit up to 65 feet thick, comprising loose

[5] Local traffic across the Surinam and Venezuelan borders is negligible. A schooner traffic in cattle between the Berbice and the West Indian islands exists, but is not large in volume.

rounded quartz sand overlying white clays. Fossil imprints in the latter indicate the sedimentary nature of the formation, which was formerly thought to be of residual origin. It appears that the crystalline platform in late Tertiary and early Quaternary times lay below its present level, and was flooded by the White Sand Sea. The granite islands studding it crumbled to provide the white sands, and darker elements in the formation were contributed by streams from sandstones further inland. The formation has not been completely mapped, but is known to go a surprising distance inland, as in the Potaro basin.

The raising of the land to its present position was accompanied by a seaward tilting of the series. The lower end of the slope was covered over by the sediments forming the present coast. An artesian system was thus formed, which is of considerable value to the agriculturalists of the coast.

Borings for artesian water indicate that the story was complicated by a considerable eastward depression of the rock floor, which is reached at little more than 300 feet below the surface at the mouth of the Essequibo, but is not met at all in borings over 1,500 feet deep, east of the Berbice river. In between, borings get progressively deeper eastwards. It is not certain whether this is part of the western limb of the great Amazonian syncline, nor is the relation of the warping to the deposition of the White Sands clear. The gradual depression of the rock floor did, however, make possible the accumulation of great thicknesses of sediment, and it is on these deposits that almost the whole population of British Guiana now lives.

The coast sediments show few unconformities, and consist of a fairly regular succession of clays, shales, silts, sands and beds of lignite and semi-lignite. The principal modes of accumulation are still clearly visible. Large quantities of almost liquid mud ("sling mud") are moved in and out with the tides, and where inshore currents are not too strong and waves do not dash too sharply, much remains behind, caught on the coast by the courida bush or wild rice grass, and in river mouths by the mangrove. Courida spreads its roots far and wide in soft mud, and throws up peg-like breathing projections which hinder the retreat of the sling-mud. Wild rice (*Spartina brasiliensis*) also extends its stolons rapidly underground, throwing up new shoots and anchoring itself by extra strong deep roots. Mangrove anchors itself by sending strong shoots downward through the air to the mud. In these ways floating mud is fixed, and the land raised above sea level. Currents shift, however, and courida and wild rice are particularly liable to be swept away. The first planters on the Demerara coast had the protection of a belt of courida, and an earth dam, with brushwood mattresses, was the only artificial aid necessary. The courida was swept away by a change of current, and the fearfully expensive direct battle with the sea began, which ruined many planters and burdened the Colony with a heavy debt which is one of the chief hindrances to its economic progress.

Lagoons are frequently formed behind spits, in which rank

vegetation flourishes until there is an accumulation of decayed peaty material. This, when drained, forms an excellent light soil (pegass) particularly common on the Pomeroon coast. Shelly material mixed with clays or sands forms another light soil called caddy.

North-west of the Essequibo the coast alluvium is thinner and narrower, and beyond the Pomeroon river has never been empoldered. The Pomeroon district is drained by short streams only, and is very flat and swampy. Swamp forest, composed chiefly of mangroves and truli and manicole palms, extends to the sea. Settlement for agriculture clings close to the lower Pomeroon and the mouth of the Moruka. Coffee, coconuts and ground provisions[6] are grown, though coconuts are not entirely suited by the clay soils. Wooded remnants of sand dunes provide " bush islands "—dry sites for the aboriginal Indian population of the Moruka Reserve.

The western part of the North West District belongs to the sandstone formation[7], but over the rest of the territory the long winding rivers have spread alluvium in broad swampy valleys between hills of sandstone and ferruginous laterite, which come close to the coast. The extensive swamp forest is rich in the giant hard-wood, mora, (*Mora excelsa*) which is a favoured building timber in the Colony ; and in crabwood (*Carapa guianensis*) which has unfortunately been largely exhausted by reckless cutting. This remote coast was thought to be suitable for rubber, and plantations were made during the Brazilian boom. Part of the population attracted at that time remained and colonized small patches on the lower Barima and its effluents. Gold discoveries in the middle courses of the longer rivers provide a floating population, with a much-decayed centre at Arakaka, at the first rapids of the Barima. An unpleasant swamp, eighteen inches above the river, provides a site for the village port of Morawhanna ; an alternative outlet, favoured by gold-diggers, is through a natural canal to the Moruka. Gold, mora logs, firewood, mangrove for the local tanning industry, ground provisions, coffee, some citrus fruits, and casareep[8], are the principal products. In both the Pomeroon and North West Districts, over half the population is aboriginal Indian.

The North West District is served only once a fortnight by small steamers from Georgetown, as is Charity near the mouth of the Pomeroon River. The latter may, however, be reached any day by a more tedious route, via the railway and the Essequibo ferry, or by cargo boat to Adventure. A motor launch of very limited capacity serves the Moruka River from Charity.

### Regions of the Interior

In its main outlines, the structure of interior northern British Guiana resembles that of the other Atlantic edges of the Guiana and

[6] Such as yams, cassava, sweet potatoes, eddoes, tannias, string beans, pumpkins, squashes, black-eyed peas.

[7] See page 172.

[8] The juice from cassava is highly poisonous until boiled when it becomes harmless and is known as casareep. Casareep is principally esteemed for its use as the basis of the famous West Indian pepper-pot stew.

Brazilian plateaux. A low platform (300–400 feet) of complex Archaean and Pre-Cambrian formations supports a huge, almost horizontal mass of sandstones and conglomerates conjecturally of an age roughly comparable with the Torridonian of Scotland. This sandstone mass has a thickness of up to 1,500 feet, which is greatly exaggerated in many places by volcanic intrusions. The formation is known as the Kaieteurean, from the great waterfall by which the Potaro River descends its Eastern face. The Kaieteurean occupies a relatively small part of the area of British Guiana, and except for a little ranching is quite undeveloped. Kaieteur Fall provides an attraction to the small number of tourists who can afford the time or expenditure required to reach it, and these necessarily pass through Georgetown. Almost all now travel by chartered aircraft.

The ancient rock platform makes up the greater part of the surface of the Colony. It comprises an endless variety of volcanic and metamorphic rocks, but gneisses, schists and gneissose granites make up most of the surface. These rocks weather, under an equatorial rainfall of over 100 inches annually, into soils which are poor from the point of view of agriculture, though certain undeveloped valleys may have to be excepted from this judgment. Nevertheless, the area is already of great importance for a number of reasons.

(a) Its schistose, volcanic and granitic members are the source of the gold and diamonds which since about 1890 have helped the Colony over several bad periods in the sugar trade.

(b) It is the source of the bauxite, which, by steady development since about 1922 has reached second place in the list of exports. The lateritic earths of the forest zone are subjected to severe weathering which removes the silica from their felspar components and leaves the highly insoluble hydroxides of aluminium, which occur as beds of white clay at or near the surface. The principal workings are immediately east of Mackenzie on the Demerara river, and lesser ones are in operation on the Berbice river (Fig. 3). The belt continues into Dutch Guiana. Mackenzie is conveniently placed below the lowest falls of the Demerara river, and is reached direct by ocean-going vessels. The ore is worked by open-cast methods.

(c) It is, together with the swamp areas of the coast and certain sand areas (see below), the forest zone—a scarcely touched area awaiting capital, communications and enterprise to become a major asset to the Colony. Small wood-cutting grants on the Demerara, Berbice and Essequibo send from this area greenheart, an exceptionally heavy timber used in underwater construction because it resists the teredo worm and the effects of salt water; handsome furniture woods like the hubaballi, purpleheart and siruaballi; and a variety of small woods for fuel. Balata was formerly extracted on quite a large scale, in Berbice and on the northern edge of the Rupununi

savannah, but has become a minor export[9]. This is not altogether to be regretted, as the scattered occurrence of the tree and the necessity for working individually and in the wet seasons make balata-bleeding an unhealthy occupation.

The timber of the interior can only be exported by the rivers. Logs of high specific gravity which would float only below the surface, are loaded on a very light framework called a sling punt, and this suffices to keep them in full view. A light railway joining the Essequibo and Demerara helps cutters on the former river to circumvent its difficult lowest rapids, but elsewhere, all timber grants are below the first falls of the river.

(d) The rock platform as a whole appears to have been intensely folded at a very ancient time by thrusts either from north-east or south-west. The general strike of the rocks is E.S.E. to W.N.W. and this has a considerable influence on the trend of the big rivers west of Essequibo. The actual relationship between strike of rocks and direction of rivers has not been worked out in detail, but their coincidence is too general to be overlooked. The total effect has probably been a great enlargement of the basin of the Essequibo, which might otherwise have been a stream with no important tributaries, like the Demerara. As it is, it has no right bank affluents. Georgetown acts as the single outlet for the Essequibo, the largest basin between Amazon and Orinoco. Its forest entrepôt is the small river port of Bartica, whose population varies directly with the fortunes of the gold and diamond industries. These minerals are mainly alluvial in their occurrence, and rather scattered. Mining and dredging operations for gold account for about three-quarters of the present production, and wandering parties of three to twelve " pork-knockers " working alluvial deposits by more or less crude methods, for the remaining quarter.

The Denham Road from Bartica to the Potaro, with its extensions, is less than twenty years old (Fig. 5). It is served by a fleet of government-owned lorries, and is very useful because of time saved and rapids avoided, but its charges are necessarily high, its weight-carrying capacity limited, and wear and tear are excessive. Other short roads in the interior are of purely local interest. The only river bridge in the Colony is that carrying the Denham Road over the Potaro, ferries being employed elsewhere. Small steamers go from Georgetown to Bartica three times a week, and to Wismar (near the bauxite deposits) daily.

Other river communications in the forest region are due to private enterprise, and are either infrequent or quite irregular. The boats of

[9] Balata is neither rubber nor gutta-percha. Its chief use is for machine-belting, because it does not stretch. Methods of treating plantation rubber have been responsible for the decline in the demand for it. 480,000 lb. were exported in 1947.

a balata company go to the mouth of the Rupununi. Shopkeepers and boat owners transport parties of gold-seekers, generally from Bartica to various parts of the Essequibo basin, or parties take their own boats. River boats are motor driven, usually by outboard engines, and some are large enough to take more than twenty passengers and their equipment. While long stretches of the large rivers are easily navigable, the occurrence of transverse bars of intrusive hard rocks, usually in series and occupying several miles of river bed, creates rapids. Negotiating these is either tedious or dangerous. In many cases, skilful and hazardous navigation of known channels in the rapids is regularly accomplished. In other cases boats are emptied and hauled through the rapids or warped from rock to rock. It is unfortunate that the Essequibo, Potaro, Mazaruni and Cuyuni, the principal inlets to the chief goldfields, have more rapids than most other big streams in the Colony. The Mazaruni has thirty-four. Many are not negotiable in the dry season.

A local aircraft company, owning two land 'planes, two amphibians and two seaplanes, performs useful service in the remoter parts of the Colony, especially in cases of police or medical emergency. A large number of concrete landing strips are being laid down in various parts of the interior, and the rivers themselves are useful landings for the seaplanes and amphibians.

The White Sand Series, already discussed, extends a considerable distance into the forested interior. Towards the sea it is important economically because of its rôle in forming an artesian system. Inland, where it forms the surface, it has covered over and preserved gold which had been spread by fluvial agency on the peneplain which existed before the area was depressed and flooded. The mapping of the base of the formation has led to profitable mineral discoveries. Another feature of economic importance is that the White Sands form soils which suit trees of some value. The greenheart grows best here. The most prolific tree is the wallaba, a red wood tree much used for fuel, charcoal and shingles, and with potentialities for the production of good quality paper. This forest is much the best developed in British Guiana. It is the most accessible, being largely below the lowest falls and nearest the sea ; the dry surface encourages road and light-railway building and discourages undergrowth ; and both greenheart and wallaba are amongst the most gregarious of equatorial forest trees—wallaba occasionally composes 70 per cent. of the trees in a stand, and usually over 30 per cent.

On the west of the Colony, south of lat. 4° N., the high forest ends rather abruptly and the North Rupununi Savannah begins. The Makarapan Hills lying east-west about this latitude have forest on their northern slopes and savannah on their southern. The change is emphasised, not caused, by these hills. The region south of them cannot support forest because it does not get the short rainy season of December to early February, which the coast and central forests (and

probably the south-east of the Colony) receive[10]. It is therefore faced with a drought between mid-August and mid-April, and has a rainfall of between 60 and 70 inches annually in the northern, and 40 inches to 60 inches in the southern savannah.

In this region there is a big gap in the sandstone mountains of the western border, and the relatively low water-parting between the Essequibo and Amazon systems is a scene of hydrographic confusion, in which the Takutu has gained at the expense of the Rupununi. The debatable area around Pirara is the site of Lake Amuku, the legendary Manoa of the El Dorado story.

Both the Makarapan and the Kanuku Ranges are hard, elevated portions of the crystalline platform, not sandstone mountains like the Akarai of the southern border. The Kanuku separate the northern and southern Rupununi savannahs, and are heavily forested and scarcely known. The north-flowing rivers seem to have been superimposed on to them from an overlying formation, and occupy formidable gorges. The route between the northern and southern savannahs lies around the western end of the Kanuku.

The surface of the savannahs is a mixture of the waste-products of the sandstones and conglomerates of the western mountains and the crystalline rocks of the ancient platform. Clays form the major portion of the surface and conglomerates have contributed the huge boulders which are strewn over large areas around the Takutu and upper Kwitaro, Rewa and Rupununi. The heavy clay surface and the uncertain drainage render much of the area liable to flooding, and the development of cattle ranching is to a large extent limited by the amount of dry land, in the form of small sandy hillocks, available as refuges for the animals during the floods. Forests of ita palm (*Mauritia flexuosa*) are scattered about the plains. Innumerable termite hills complete the picture. The two divisions of the savannah are generally similar.

The Rupununi Development Company, with headquarters at Dadanawa in the southern savannah, is the only large operator, and possesses about half the cattle. These are raised on the open range system, being rounded up twice a year. The company is improving a portion of its stock, but on the whole the savannah cattle are half-wild and of poor quality. There are about 100,000 altogether, but the flood problem limits the possibilities to perhaps 20–30 cattle per square mile. Cultivation, except for a little tobacco sold in Georgetown, is wholly for local needs. The good soil which exists, mainly at the foot of the sandstone hills and in forest patches, is already used by the aboriginal Indians of the district for cassava cultivation, and surveys to estimate the possibilities of future settlement have not been very encouraging.

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[10]There is no known reason why this short wet season occurs, or why it is absent only in this corner of the Colony. Rainfall at this season is at least partly orographic in type, as distinct from the convectional type of the long wet " doldrum " period of April–August, and heights in the savannah seem to receive some of it.

The Rupununi savannahs have two routes of interest :—

(i) The Georgetown—Manaos route via the Essequibo-lower Rupununi-Pirara Savannah-Takutu-Rio Branco-Rio Negro. This is the only outlet from British Guiana apart from Georgetown, but is only used locally by ranchers on the border, who sometimes find it convenient to get supplies from Brazil. As the configuration of British Guiana renders it otherwise a 'cul-de-sac' any long routes made into the interior in the future are almost bound to point towards this sole outlet.

(ii) The Berbice Cattle Trail, from the savannahs to Takama on the Berbice river, with an extension to the Demerara at Hyde Park. Near Takama is a fattening ranch, whence cattle go to Georgetown or New Amsterdam. This route is usable only in the dry seasons, but is actually the chief outlet for the savannahs, since boats which have to negotiate rapids are necessarily ill-adapted to the transport of animals. The cattle trail is useless for traffic not on horseback or on foot.

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# THE KON-TIKI EXPEDITION*

Raymond Firth

THIS book is the story of a remarkable feat. Six men, led by the author, set out from Peru on a balsa-log raft built to an ancient Inca design and landed more than three months later on the island of Raroia in the Tuamotu archipelago. Their adventures make exciting reading, from the extraction of the balsa logs from a remote inland forest, through the contest with gales and heavy seas as they slowly forged across the eastern Pacific, to the final wrecking of their craft on a coral reef and their own fortunate escape from serious injury. Throughout, one is impressed by the enthusiasm of the whole group and the verve with which the author tells his tale.

The book is meant for the popular market—it is a Book Society's choice—and is a translation from a Norwegian account which appeared two years ago. One cannot complain therefore of the meagreness of the scientific information in it, but only hope that the meteorological, oceanographical and other records which were made will have ample publication elsewhere. Here, there are two topics of main interest—the technique of raft-voyaging, and the relevance of this successful voyage to theories about the peopling of the eastern Pacific.

There is no doubt that the handling of the unwieldy craft by Mr. Heyerdahl and his companions was admirable. Descriptions of how they used the centre-boards for steering, or made a diving basket in order to be able to examine the under-side of the raft in safety, show their ingenuity, but considerable seamanship must also have been called for in all the daily operations of sailing, especially in heavy weather.

On the author's part, at least, however, the voyage was undertaken in pursuit of a theory. Briefly, it was that the original founder of the Polynesian people was the culture-hero Kon-Tiki, a high-priest and sun-king of a white pre-Inca race in Peru, the remnants of which were driven out after slaughter by the forefathers of the Incas, and disappeared overseas to the westward, to settle in the Pacific islands. Evidence from Polynesia itself, it was argued, supported this theory,

**The Kon-Tiki Expedition.* T. Heyerdahl. 14 × 22 cm. 235 pp. London: G. Allen & Unwin Ltd. 1950. 12/6. This brave adventure has rightly excited widespread admiration, though its scientific significance remains a matter for expert assessment. Members will be grateful that Professor Firth has responded to our request and provided an authoritative comment.—*Ed.*

and the object of the raft voyage was to show that a feasible method existed for Kon-Tiki and his followers to get from Peru to Polynesia, by taking advantage of currents and trade-winds. As the author admits in an appendix to his book, the success of the raft expedition did not prove his migration theory ; it only shows that if they had such means available (as they most probably did) people in early times could have reached the eastern Polynesian islands from the South American mainland. It provides no proof that they *did* do so ; and still less does it prove that Polynesia was peopled from that source. The case of the sweet potato, apparently a plant of South American origin, but spread widely over Polynesia, is the strongest piece of evidence for the Peruvian connection. But it is possible that the botanists have not said the last word as to the ultimate home of this plant. Apart from this, the weight of evidence is against the author's theory, which is not in fact entirely a new one.

The author's enthusiasm leads him to overstate his case, and to ignore some serious arguments against an American origin for the Polynesians. In the first place, he attaches a great deal of weight to legend, and handles it uncritically. The culture-hero Tiki, only one of a number of such heroes in Polynesian mythology, and not held in equal importance in all the island groups, is erected by the author into a genuine ancestor, progenitor of the Polynesian people as a whole. It is quite impossible to say if Tiki was ever a real man. Again, to say as he does that the details of the life of the Peruvian Kon-Tiki, with the ancient names of places round Lake Titicaca, crop up again in historic legends current among the natives of the Pacific island, means taking some big jumps in the identification of the meaning of words. But s·milarities in the form of words alone without comparison of grammatical structure is a weak link. The author talks of the legendary " white men " of the pre-Inca days in Peru, and identifies them with a racial strain of Polynesians known as *urukehu* from their reddish or light-coloured hair. But he speaks of the *urukehu* as having " remarkably pale skins," " blue-grey eyes," and saying that they were descended from the first chiefs on the islands, " who were white gods, such as Tangaroa, Kane and Tiki." He gives no authority for these statements, and indeed it would be difficult to find any. On the side of arts and crafts, again, the author often speaks of the work of the Polynesians as being " exactly " like that of the ancient Peruvians. There are usually in fact significant differences, and it is worth noting that the universal Polynesian tool, the adze, is not a form in vogue in the Peruvian field, even in antiquity. Finally the languages of Polynesia, which have been quite extensively studied, relate quite closely to those of Indonesia and South-east Asia, and have no resemblance in morphology to those of South America.

The origin of the Polynesians has still some unsolved problems, but little light is thrown on them by this book. This in no way mars the originality and splendour of the achievement of the crew of the Kon-Tiki.

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# THE TEACHING OF GEOGRAPHY FOR INTERNATIONAL UNDERSTANDING*

UNESCO INTERNATIONAL SEMINAR, MONTREAL, JULY 12—AUGUST 23

GATHERED together in the picturesque setting of MacDonald College, near Montreal, are the chosen representatives of more than twenty nations. Their purpose is to examine anew how the content and aims of geography can be reoriented more effectively towards the improvement of international understanding. The war in Korea gives a very real sense of urgency to this task. Rarely have people from such diverse cultures met together and developed such a corporate spirit of united endeavour. Differences of language and of terminology were at first considerable handicaps to easy exchange of ideas, but somehow or other geographical training has within itself the very essence of international understanding. The will to understand was therefore always present; the determination to find new ways of teaching geography was very strong.

The result is that these geographical experts, many of international repute, have come to friendly agreement on the following aspects of their work. They have agreed upon a common content and a common purpose for geography. They insist that from the age of 9 until the age of 16, there is a need for the teaching of geography as a separate but not as an isolated subject. Geography is not to be taught solely for its own sake at the school level. One of its greatest and noblest purposes is to form part of a planned effort to develop an understanding of other peoples the world over. The task, therefore, of a geography teacher is not merely "how can I teach geography better," but, "how can I teach my geography so that the ideas of, and the wish for, international understanding naturally and inevitably arise in the minds of the children."

The geographer has a common purpose with all other teachers in a school. One of the major aims of school is to train future citizens to think wisely about political and social conditions in the world. Each subject specialist, no longer sitting in an ivory tower but working with his colleagues as a team on a co-ordinated plan, will provide a particular point of view for studying common problems.

Future geographers will be constantly seeking to teach fresh matter which is up-to-date and relevant to the lives of the children; they will be constantly seeking new methods of making the subject matter interesting; but they will still have two permanent characteristics: (a) the geographer's way of looking at the world and the problems of

*This interim report was received from Mr. N. V. Scarfe in mid-August when the Unesco Seminar was still in session. Further information regarding its discussions and findings will, it is hoped, be presented at the Annual Conference in January, 1951.

the world, and (b) the persistent school objective of educating children for better social living, i.e., creating right and desirable attitudes. It is because geographers and historians have a distinctive point of view, even though they may treat of the same up-to-date subject matter for the same final objective, that history and geography cannot be muddled together in the woolly, unfocused and often aimless social studies. All education must be socially functional. All education must also be concerned with the development of the individual. These two purposes are achieved best during the school years 9—16 by separating temporarily the various view-points from which common knowledge can be studied, analysed and understood.

Children under the age of 9, however, should not be taught *subjects*. They are not ready to analyse knowledge, they are merely collecting it indiscriminately before that age, chiefly to develop their skill in reading, writing and arithmetic.

At the age of 15 or 16 comes the stage when acquired knowledge and skills can be applied to problems affecting the world. Applying knowledge to these adult problems is often termed integration and is best done when children have reached adult powers of reasoning. Subject disciplines come together best when children are able to develop a philosophic attitude to life and knowledge as a whole, i.e. at about 15 or 16 years of age.

Sufficient has been said to show that this seminar devoted to the teaching of geography is not one which ignores education as a whole. On the contrary, a great deal of time has been devoted to the study of the modern philosophy of education, to the psychological and sociological study of children, and to the training of teachers ; in addition, special consideration has been given to the development of attitudes among children. Geography can only be effective if the specialist teacher of that subject sees how his work fits into the general scheme of education and how he can play his part as a member of a closely-knit team of workers animated by the same desires and purposes. For the development of international understanding, nothing seems more important than that teachers in schools should get together more effectively in seeing each other teach, in discussing their common problems and arriving at common ideals and purposes.

The integration which the present so-called social studies teachers want should be done in the staffroom, not in the classroom. In school, analysis comes before synthesis, and partial syntheses come before complete syntheses. Geography has within itself the partial synthesis of relating man's life and work to the conditions of the place where the work is carried on. It has a growing and progressive way of arranging various syntheses in order of difficulty throughout a school course. By muddling history and geography together, no such biological growth and development of ideas suited to various age levels is possible. Children grow separately and individually ; they are not an amorphous mass of humanity growing haphazardly. Similarly, subjects grow and develop at first separately in the child's mind, because each subject has

its distinctive and individual contribution to make to common knowledge.

The English delegates are Miss R. Phillips of Homerton College, Cambridge, and Miss B. Broadhurst of the City Training College, Leicester. Miss G. Howells, H.M.I., is one of the group leaders who have helped to plan the course. Mr. N. Scarfe, of the Institute of Education, University of London, will have the difficult and responsible task of writing the final report on the findings of this historic seminar. It is hoped that Unesco will make this final report available to all teachers of geography the world over.

# GEOGRAPHY AND "SOCIAL STUDIES" IN SCHOOLS

*A memorandum prepared in June, 1950 for the Council of the Royal Geographical Society by its Education Committee, and reprinted here by kind permission.*

THE term " social studies " is used nowadays in two senses : to denote a certain advanced discipline at some of our universities, and to indicate a subject recently introduced into the curricula of schools, particularly in Modern Schools and in Training Colleges preparing teachers for them. It is with the latter sense that this memorandum deals. So understood, " social studies " represent an attempt to compress several branches of learning into one. The result is exactly what happens when a lemon is squeezed : the juice is removed, and only the useless rind and fibres remain. The attempt may be attributed, first, to the influence of American theories, which, however, have since lost ground in the United States and also in Canada ; secondly, to the pressure of subjects in school curricula ; thirdly, to a new and rather dangerous conception of education ; and, fourthly, to the necessity for training teachers quickly. It is felt that " social studies " will destroy the value of geography as an important medium of education, and the Education Committee is concerned at its spread in the schools.

## The Present Position

Most teachers of geography in primary and secondary modern schools come from the two-year Training Colleges, where far-reaching changes are taking place in the curriculum. One major change in particular requires careful attention. This is the substitution, in most colleges, of a course in " environmental studies " for the ordinary courses in geography, history, biology, and the physical sciences. The aim is said to be to enrich personal experience and widen the social outlook of the student. The course is usually compulsory for all students : it may last for six or more weeks, or be spread over the whole

two years. As a result, the number of teachers-in-training who study geography beyond the stage they reached at school is reduced to the small percentage taking " advanced " geography. There is also the danger that student-teachers may misunderstand the special purpose of this course of " environmental studies " in their own training, and regard it as another " subject " suitable for the primary or secondary modern school.

In fact, under the name of " social studies " this new subject is being increasingly taught in schools, especially secondary modern schools, where it displaces geography and history as separate subjects in the time-table. It is difficult to estimate precisely how far this elimination of geography as an ordered study has proceeded. There is, however, much evidence of a strong tendency to " break down the barriers between subjects " (an explanation given for the change) and to teach an amorphous hotch-potch of geography, history and " civics " under the heading of " social studies." The contents of the courses varies considerably from school to school; most contain a little geography, but in a disjointed and attenuated form, insufficient to preserve the characteristic outlook and discipline of the subject, which in recent years have come to be regarded as indispensable in the education of citizens.

Moreover, in many schools geography, influenced by the new trends, has become largely a superficial study of a series of social and economic topics, to the almost total exclusion of the physical basis. Thus, though still called geography on the time-table, it is scarcely distinguishable from the " social studies " mentioned in the preceding paragraph. There has also been much emphasis on a type of local study, which consists of scraps of social survey leading to an acquaintance with the civic services of local government. Again, it has been an easy step to change the name to " social studies " and to omit aspects of local study that the geographer regards as essential in any school geography course.

These developments are in part due to a new attitude to educational theory and practice which is exercising an increasing influence in the schools. Its adherents regard education as the adjustment of the child to its social environment, and not as the development of the child's individual potentialities within the environment. From this point of view education is a social process, which the child acquires through experience and activities related to the contemporary world. The curriculum therefore ceases to contain separate subjects on traditional lines: these are replaced by " projects " centred on social topics and by " activity methods " of study.

These changes are also related to views on the capabilities of pupils in the secondary modern schools which include 70 to 80 per cent. of our children from eleven to fifteen years of age. The Norwood Report characterizes the secondary modern type of child in the following words: " He is interested in things as they are; he finds little attraction in the past or the slow disentanglement of causes or movements. . . . Because he is interested only in the movement he may be

incapable of a long series of connected steps ; relevance to present concerns is the only way of awakening interest, abstractions mean little to him." Even if this were true of all secondary modern school pupils, and it is certainly not, it points to a more realistic and less academic presentation of geography for some pupils, and not to its submergence in social studies. It must be repeated that if such a submergence occurs, this branch of learning cannot make its characteristic contribution to education.

### The Dangers of Teaching " Social Studies " in Schools

These developments must impair the standards of instruction in geography. An attempt to study a group of subjects together introduces such complexity that children cannot see any general pattern or gain a clear and memorable educational experience. The geographer is well aware that knowledge is whole, but makes no apology for dividing it into separate subjects for the purpose of learning. History and geography, for example, are distinct branches of study, and each is recognized as having a unique contribution to make to the intellectual equipment of the educated citizen of to-day. But these contributions are different, and cannot be made unless the recognized content and characteristic method of presentation of each subject are preserved. This is impossible if the two, with others, are merged into a single subject, " social studies."

Local studies are usually stressed in schemes of " social studies." They are undoubtedly an essential part of a good geography course, but local studies in a geographical setting are very different from local studies in a " social studies " course. In the former setting they are, or should be, related to a larger whole, first the homeland, and then the world, and in these relationships lies their chief value. If the locality is studied in great detail, down to its very trams, rates and sewers, then the time left for the great countries of the world is likely to be inadequate. Which is more desirable—that a child should know the number and dispositions of all the hospital beds in the borough or that he should have some idea of the broad geographical features of the principal countries of the globe ? This is in fact the kind of alternative presented in some schools at the present time. It is not true that a child is ordinarily interested for long periods of time in the myriad details of the life of his own locality. Boredom usually sets in before a full term is out. The strange and unfamiliar can always command his attention and stimulate his imagination. A sound geographical approach continually links aspects of the local area with the geography of more distant lands and imparts a fair and realistic idea of the home country and of the broad natural and human features of the continents. In the study of distant lands it is their geography—that is, their present reality as the home of man—which is essential.

The emphasis placed in " social studies " on human affairs and the complexity of this subject matter lead to a neglect of the natural environment in which man lives. It is the geographer's aim to balance

these two aspects, the natural and the human, and an essential contribution of geography to education is the appreciation of the relationship between man and his environment throughout the world. So much damage has already been caused by neglect of this relationship that the omission of this theme from education would be disastrous.

### The Place of Geography in Education

The Committee considers that the present unsatisfactory position of geography in the curricula of schools which have adopted the new "social studies" is largely due to failure to understand the nature of geography. A re-statement of its content, suited to the education of the city child, should remove much of the present misunderstanding. Its subject matter—the earth as the home of man—must give it an important place in education.

The geographer, like workers in other fields, draws some of his factual material from other branches of knowledge—the natural sciences on the one hand and the humanities on the other. His primary interest is in the distribution of these data, and he employs his particular technique, map making and map reading, with other visual and verbal methods, to analyse, describe, and relate them. His aim is then to perceive and understand the inter-relationships of these facts. In school this usually becomes a study of man and his activities in the natural environment. The degree to which the complex relationships are studied will be adjusted to the ages, aptitudes, and abilities of the pupils. With senior pupils the emphasis will be on this interrelation, and it is this training which forms the main contribution of geography to education.

Geography is a vital link between the natural sciences and the humanities, and, in fact, brings out the essential unity of these two spheres of knowledge. It is upon this position that its claim to importance is based. Hence, the place of the geographer in the fields of knowledge and education is vital even in schools.

The importance of geography at all levels of education is urged not only by geographers, but by many educationists of standing and experience. "I therefore want you to make the bold claim," said Sir Cyril Norwood, "that geography is an essential part of education whatever forms education may take, and that there can be no question of dropping it in any considered course of study: it is in my opinion more important than a foreign language or a science, highly important as these are, for the simple reason . . . that the intelligent person must understand something about the world and the country and the district in which he is set to live his life." The steadily increased importance of geography in the grammar schools is reflected by the numbers of those offering the subject in public examinations. Up to the present, "social studies" have not made much headway in these schools, and it is hoped that any pressure in favour of the innovation will be resisted.

The progress of geography in the grammar schools has been paralleled by the increased attention given to it in the Universities,

where the number of professorial chairs has increased by eleven since 1939, so that geography now ranks as one of the major advanced studies.

### Conclusion

The intellectual power and habit of mind afforded by a sound geographical training, with the factual content of the subject, are vital and unique contributions to the educational equipment of future citizens, and cannot be omitted without grave loss to their education. The essentials of a school geography course are :

(a) a training in the use of maps ;
(b) an appreciation of the orderly grouping of significant facts, physical and human, leading to a balanced conception of the neighbourhood and its setting in the home country, and of the major varieties of natural environment and human activity in the world ;
(c) some understanding of the relation between man's activities and his natural environment.

The organized presentation in school of the significant facts and the gradual emergence of coherent geographical unities are of high educational importance. Upon this basis boys and girls can be trained to be intelligent and enlightened citizens. Social studies alone, even with a geographical bias, can never yield a comparable result.

# INDIVIDUAL PROJECTS IN GRAMMAR-SCHOOL GEOGRAPHY

R. J. Foster*

PROJECTS in a grammar school ? Usually the syllabus seems full enough already ; yet they can be attempted, and this is the story. Aided to some extent by a fortuitous time-table arrangement, we were encouraged by the enthusiasm of the boys themselves—when a class has to be told three times to " finish off " at the end of a period, one may assume that some satisfying work is being done.

The forms of which the work has been done are of second-year boys of Bishop Vesey's Grammar School, Sutton Coldfield. Their average age is 12·6, their level of intelligence of course varies, but still more does their social background. Whereas one boy may come from a well-to-do cultured home where there is space and opportunity to indulge his hobbies, another may be one of a large family in a small house where

*Mr. Foster teaches in Bishop Vesey's Grammar School, Sutton Coldfield, and helped Mr. W. H. Sutton, Senior Geography Master, to initiate the experiment he describes in 1947–48.

even living space is limited. Necessarily their interests and experiences will be very diverse. Yet they are all embarked on a course of study which will be practically identical for each boy. Can we not take note of their differences : let each follow his own bent for a short while in school ?

There is an advantage in taking Geography as our basis. In it is found the unity of all sciences, and since its study leads from the boy's home to the farthest horizons of the globe, somewhere his interests are bound to be caught. In so doing we hope that those aims we set ourselves as geography teachers may be better achieved—not only the practical and intellectual end of knowledge of the world, or even the realisation of the social and economic inter-dependence of man, but mainly in the higher cultural aspects, arousing a spirit of enquiry, a desire for travel and a discernment of beauty. Leisure activities may take on new meaning, or indeed the boy's work may itself become a hobby. With encouragement and guidance, his reading and observation become purposeful and fruitful : his own method of approach will be all-important, and he will gain a dignity and sense of responsibility. Our main purpose, then, is to encourage the boy to develop his own special interest in geography.

In so looking to the individual, we do not require solely " bookish " study. There should be opportunity for the boys to make models and sketches, collect pictures, samples and specimens, do their own research. The drawing of large maps as distinct from note-book sketches is encouraged, for this is an exercise of skill and a training in neatness. In shifting the emphasis to practical work we are calling powerful innate propensities to our aid, and activity which brings these forces into play is bound to enlist the boy's interest and engage his mind profitably.

It so happens that these forms have each had a period on Friday afternoons when the senior school is taking part in J.T.C. training. It has been named as a Geography period but is considered an ' extra.' For that reason it is available for work of a nature outside the syllabus for the year. So on the first Friday of the year, in turn the forms come to the Geography Room, speculating about this lesson which they have heard is going to be different. It is necessary to get them started.

Our gambit is to ask if anyone has a special hobby—thus we hope to reach at once some boy's particular interest and enthusiasm. A pause for thought, and perhaps one boy will say that he collects stamps, another that he builds model aircraft. We then have to show how these link up with geography—the relationship will probably at first be obscure to the boys, and needs development and presentation. We can throw out a few ideas and hints—a map to show the countries included in the stamp collection, the routes the stamps took to reach England. With this lead there will be suggestions and a short discussion can be allowed to develop. Summing-up we can say, " Find something you'd like to do and go to work."

This short introduction over, the class is allowed to split up. To

stimulate their ideas, it is convenient to let them browse for some time in books from the geography library. The *Geographical Magazine*, the *National Geographic Magazine*, Stembridge's *Life and Work at Home and Overseas*, Pickle's *World and Its Workers*, and others are useful here. The teacher's part is now to make himself available for advice and discussion. The first boys to come forward with ideas and a scheme are, as one would expect, those with some hobby close to their hearts, only too glad of an opportunity to extend it into the schoolroom. Naturally tactful guidance has to be given occasionally so that the boy is occupied to his best advantage. For instance merely to carry on swapping and arranging his collection may be for a time eminently satisfying to our young philatelist, but we feel justified in pointing out further possibilities.

Closely following are the boys who have some interest which is not a hobby but which can still provide inspiration. For instance one boy has an uncle who writes fluent letters from the Argentine—the boy is eager to learn more of South America and show off his special knowledge. Now he has the chance. Of course we should try to use such opportunities like that in normal class teaching, but should we always have time or even always discover such material ?

Soon these will be profitably and actively engaged, and others will follow their example. Indeed many will enlist the help of their friends. The boys, by nature gregarious, are happier with a partner, and by keeping the groups small and, as far as possible voluntary, we ensure that each boy is contributing to the effort and that the value of the work to the individual is not lost.

However, after three weeks or so, there remains a knot of boys who are still turning the pages of their books, rather aimlessly and by now without much interest. It would be easy to dismiss them as lazy, but even a lazy boy dislikes to be out of anything and these look rather forlorn. It is more likely that they find difficulty in making up their minds, or still need a stimulating idea, or lack self assertion, or are unsure of their ability. A few minutes' quiet talk brings some interest to light. There was one boy enthusiastic only about professional football. He was left happily making a map of the homegrounds of the various teams : perhaps later he will spot their connection with the industrial areas.

It may be objected that the teacher is playing altogether too large a part and that these individual projects are too much based on his suggestion. To this we answer that most of the boys produced original and sound schemes, and if the original thought did not come from the boy, he rapidly by keenness and enterprise made the scheme his own. In the words of P. B. Ballard " an astute and experienced teacher will often know what a boy will like to do better than the boy himself."

The master himself has to be ready to give helpful criticism and guidance throughout. Occasionally the boys need steering away from some dead-end path, and very often their aims need clarification. For example, one boy made a world map of sea routes, and, to fill up the

empty spaces, intended adding in figures the populations of the countries. He was easily led to see that the railways or main products would make a better job.

Problems of method and materials have to be met as they arise. A constant trouble these days is the shortage of materials. Drawing paper, coloured inks and paste can be provided but plywood is practically unobtainable. It says much for the keenness of the boys that such difficulties have been overcome—large sheets of cardboard and other useful gear were brought from home, plasticine and putty were bought with their own pocket money.

Let us now look at some of the work undertaken. Some of it is crude and lacks finish, some could have been improved by a more practised touch, but we cannot expect perfect show-piece work from boys of twelve. We have left the working-out as far as possible to the boy and guarded against unwanted interference. If the boy is to learn by doing, he must make his own mistakes, criticise his own work, not look on uncritically. For we are not concerned so much with the result as with the value to the pupil of his own efforts. On the other hand the mainspring of the boy's purpose is the attainment of the result he has imagined. We can help to set his aims high by arranging an exhibition of completed projects at the end of the year. The idea of showing his work to the school is a stimulating one—he realises that only his best will be good enough : his self-assertive propensity is tickled, and we can enlist the competitive motive by offering a small prize for the best exhibit.

Two boys who hope to go to sea had made a hobby of modelling ships and collecting picture postcards of crack vessels issued by shipping firms. They noticed the various ports of registry and decided to investigate the functions of the ports of the British Isles. They hunted through books, and wrote to a number of port authorities, so amassing a collection of plans and brochures. The result of their researches is a large map of the British Isles giving the position, routes, hinterland and main trade of the big ports, with an inset diagram of each showing its site. Together with this is a model of a dock showing the basin and approaches, warehouses, coaling jetty and shipyard. The dockgates are shut and a tide-scale shows low water.

Other groups have between them depicted the natural vegetation of the continents—primarily attracted by the chance of drawing large maps in bold colours. Considerable ingenuity is evident—sand sprinkled on wet paste indicates desert, grass the savannah, leaves and twigs the equatorial forest and so on. One group hoped to do even better. In undertaking the vegetation of Europe, they have tried to shade each region with a sample representative of that region's flora, e.g., the coniferous forest by sprigs of pine leaves, deciduous forest by hawthorn leaves. As might be expected, the map appears a confused mass of green, and to some it might appear rather as waste of time. But the idea was good, the research worth-while and above all they learnt a useful lesson on the necessity for contrast and distinctiveness

in good map-work. This work is all related to the activities of man by pictures and notes on the farmer's work of each region.

Local topography has found favour with two cyclists : they have produced a relief model—layered cut-outs of the contours taken from the six-inch O.S. sheet rounded off with *papier-mache*. This led to study of routes and settlement in the area—the beginning of a local survey.

These are only a few of the pieces of work attempted. The exhibition apart from its incentive value does form a means of instruction, by making the work of the groups available to a larger circle. No doubt the boys of the class had an idea of what the others were doing, but by seeing the exhibition laid out before it opened, they were able to gain a more detailed picture and pick up information of value. Similarly the seniors profited by walking around. The amount of knowledge so gained is probably small—it is difficult to assess—but if an exhibition is attractively set out, the maps and models appealing to the eye, and the lesson in each easy to follow, a casual visit may well produce a greater impression than we dare to expect.

This brief account is bound to be incomplete and is only put out as a suggestion. The scheme obviously is flexible and can be adapted to other conditions and needs. Certain defects are however evident. One is that the work of this period will tend to be largely divorced from the syllabus work. It behoves us teachers to point out any connection wherever possible ; if need be to step slightly from the main path of our class teaching to link up with some work being done. In this way the interest and enthusiasm generated in this period may be transferred to the general study of geography, once the boy sees the connection. Moreover it is a pity that only geography is involved. A further improvement would be to extend it to other departments of study. However we find that the geographical aspect fills the boys' time, though occasionally the historical approach suggests itself as in further work on the local geography topic already mentioned.

A final criticism may be that the attention of the class is dissipated over too large a field. Should we not be better employed in working around a central theme as in more usual project schemes For instance a local survey can be wide enough for the whole class to participate in it. But if we do that, we shift to an entirely different basis. Our aim was to encourage individual tasks and interests, and we could not then expect to take these so completely into account. In other words we shall no longer leave the initiative with the boy : it will be our scheme rather than his, even though we may still arouse his enthusiasm. A central theme would make for a better exhibition—but we are not primarily aiming at a good exhibition : we want the boys to profit by the work during the year.

The needs of the pupil are the determining factor. Have we managed to inculcate a keen personal interest in geography ? It is claimed that we have. Properly handled, the enthusiasm aroused in this period is carried over to the other geography lessons. The verdict may in fact be left to the boys themselves. A rough poll of the

popularity of subjects was taken in the second-year forms. There was another parallel form of boys who did not have this opportunity for individual work but who have the same geography master, and so formed a control group. Geography was placed by them as the fourth most popular subject, whereas the other two put geography in the first place. Now we may not agree that what they like is necessarily good for them, but it may easily be that what is good for them is enjoyable.

Further as the boys go up the school the interest here aroused seems to stay with them, although these periods are not available in the higher years. They can always recall the work they did, though naturally the memory tends to grow dim. It would appear, however, that this period really gave them an insight into the possibilities of the subject, and the training in working on their own, collecting and arranging their own data, was of considerable value. In fact this period laid a good groundwork in the subject.

We believe that this is a method which brings about a more satisfactory understanding of geography. By letting the boys follow their own bent, they are enabled to link the subject with their everyday life and leisure activities. There is variety in it and purposeful activity in the form in which they individually most delight. The teacher too can appreciate a period in which he has not to teach in the usual sense : when the attention and industry put forth by the class do not depend so greatly on his efforts, although as we have seen his part is no small one, needing a tactful, co-operative and understanding spirit. The fact that the scheme as a beginning is relatively simple will recommend it to many, since it requires no elaborate material, no radical timetable alterations, no complicated arrangements. Yet we hope to have given each boy a particular interest in geography, and the realisation that geography is not an affair of class-room and text-books. Because we believe in the value of geography as an educative subject, then a better understanding will help to produce better citizens.

# GEOGRAPHY WITH 11-YEAR-OLD "C" STREAMS

G. W. A. Sparrow*

AT the beginning of last year I found myself with the rather formidable task of teaching geography to a class of 52 eleven-year-old mixed " B " and " C " stream boys and, within a very short period, became acutely aware that any normal type of lesson programme would give, generally, indifferent results. The awkward

*Mr. Sparrow taught in the Boys' Secondary Modern School at Handsworth, Birmingham, at the time of writing this article.

question then arose :—What method of "attack" should be used ? Should a project, or series of projects, be conducted, or should these be pushed out of the way and a series of films and lantern lectures be offered ?

The type of pupil to be catered for was a low "I.Q." boy of between eleven and twelve years of age, whose main interests were such things as "Twopenny Bloods," speedway racing, and other similar subjects including, very fortunately, railways. This last interest may truly be said to have been approaching fanaticism with many of these boys. That these interests were thriving and could tend to take a major part in the lives and thoughts of these boys was an undisputed fact—so why not exploit them ? Why not relate (say) the railways of Great Britain with those of the country to be studied ? As the United States of America were on the syllabus, this was a relatively simple matter.

The two local regions of British Railways were approached and were most co-operative and helpful on the matter of organised visits by small parties of boys to locomotive depots. As most of the visits were held out of school hours no interruption of normal school work ensued, and, without exception, these boys considered it a great privilege to attend them. The effect on discipline caused by the competition to be selected for the visits was also very marked. Several American railway companies were also approached for publicity literature, etc., and responded with such generosity that there are now mountains of material for each boy.

Very little actual lecturing was done with these boys, the general method being to give each boy his head and let him read, copy drawings, or do whatever took his fancy in connection with this publicity material. In the matter of drawing ability, the fact that many of these boys were not the best of artists was overcome by the use of the very barest of teacher-drawn guide lines with altogether startling success. Almost no notes were taken as the visual sense is at once the easiest and the most effective to appeal to. Use of this visual sense was further displayed, or rather exploited, by a really liberal display of maps, pictures, etc., on the classroom walls, most of it being the work of the boys themselves.

This, moreover, has been only one of a series of very profitable experiments. About ten lessons were given over to the reading of maps which the class attacked with the greatest enthusiasm. They were first of all told what a map was (and here the explanation that a map is similar to a view of the place or area from the air seemed a most helpful approach). The various American States gladly supplied copies of their highway maps free of charge and so the game began. Maps were distributed throughout the class, one map per boy, and each boy was told to try to carry out the following operations :

(a) Find the name of the area concerned.
(b) Find the names of all the big towns.
(c) Trace the tracks of the main roads, rivers, railways, etc.

This proved very popular since these maps are very attractively produced and are frequently backed with full-colour photographs of the State in question.

" But," the Local Studies people will say, " What about our own excellent Ordnance Survey maps ? " In answer to this, it should be pointed out that the American maps were studied in a comparative way with well-known local areas. The one-inch O.S. maps used for the latter called for more guidance from the teacher as they tend to be more complex in appearance. Contours were also explained to small groups at a time and it is a significant fact that a few boys are now able to draw tolerably good hill sections and seem to find it most interesting. Many models are also made such as :—cattle ranches, American towns. and even by one ambitious set of boys, a freight yard.

But Human Geographers will assert that the human side of the picture has been ignored in favour of the economic, and Educationalists will be sceptical as to whether anything of value has been learned. In answer to these potential criticisms, it should be stated that in the writer's opinion a " Humanised Economic " approach is more desirable than a purely human approach. Also, while the learning capacity of these pupils is not great, the desire to know more is awakened to a very considerable degree.

In conclusion the writer is fully aware that this article may be subjected to criticism ; that is only to be expected on such a subject as this and indeed such criticism will be welcomed in the hope that it will stimulate more interest in this branch of geographical teaching.

# HOLIDAY GEOGRAPHY

Laura M. Budden*

IT was September, 1936. The school had reassembled after the long summer holiday. Two sisters had been to the Isle of Wight and they had done little else but lounge on the sands : they had visited no place of historic interest, had not climbed a hill nor walked as far as the next village.

This scrap of conversation between teacher and taught led in the following July to the suggestion that everyone in the school should come back after the holiday prepared to write an essay on the local geography of the place visited during the vacation or an account of a building of historic interest or of a factory or farm.

One boy who went to camp at West Wittering, in Sussex, wrote a remarkably good geographical account of it. This simple type of

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holiday geography continued year by year until the war started in 1939 and normal holidays ceased.

It was September, 1944, when the youngest sister of the boy who had written about West Wittering brought to me a letter written to her parents by her brother in India. It was a lively account, vivid with local colour, of a journey he had made from Bombay to Poona. His powers of observation had grown with the years. This letter set holiday geography going again.

In July, 1946, about half-an-hour was spent in each form. This was time enough to suggest that each boy and girl in the school should become the proud owner of a geography book. Each book should have an original design on the cover and should be given a title : the book to remain the property of the owner. It was suggested that those fortunate enough to be spending some time on a farm could become acquainted with the implements used by the farmer on his fields, learn something about feeding animals, about the rotation of crops, perhaps make a study of field names and finally get some idea of a farmer's trials and triumphs. Those going to the sea might have an opportunity of visiting a lighthouse, of keeping tide tables, of making collections of shells, of floating seaweeds on to sheets of cartridge paper, of gleaning much knowledge of ships, fish and the ways of the sea by chatting with fishermen. A visit to relatives living in a town might give opportunities of getting to know something of our castles, cathedrals, museums, picture galleries and factories. Some might like to make an album of wild flower drawings with captions beneath each to explain on what kind of soil they had been found growing or of birds seen, with captions on bird ways. The description of the outward journey, by road or rail, together with maps and pictures to illustrate it would make an interesting study in itself.

The response was encouraging. In some forms 100 per cent. presented good and even excellent books. Holiday geography has now become part and parcel of the geography course. A twelve year old girl did not go away for a holiday. She drew a map of the common hard by her home ; made some mention of the soil found there ; stated where and when she had found certain wild flowers, butterflies, birds and adders on the common, and illustrated the whole with sketches of herself and others enjoying themselves there. A fifteen year old boy designed an artistic cover, introduced his book with a quotation and wrote an excellent geography of Tyting Farm, Guildford. He drew a plan of the farm, showing the fields and field names, added the rotation and drew a page of sketches showing various farm implements. One or two of his snapshots were not unlike the scenes so often painted by Van Gogh. Another lad about the same age showed that two farmers in his village practised different rotations. A second form boy worked on a farm during the holiday. His book gave an outline of the various field tasks which must be undertaken during the course of a year. Some of the third formers made collections of seaweeds, others drew and tinted shells or made little envelopes in which to place samples of rock. These

collections accompanied written work. A twelve year old boy drew a large map of the Isle of Wight and pasted on it in the appropriate places very small snapshots of the places he had visited.

Among the books were some describing visits to Holland, the Scout Jamboree in France, a hitch-hike journey made alone from Youth Hostel to Youth Hostel travelling from Guildford to Oxford, from Oxford to Cambridge and from Cambridge back home to Guildford. A first form boy described his journey to Ireland and the holiday he spent there with a graphic word picture of turf (peat) cutting.

These books were not corrected in any way but a word of appraisement was written at the end of each. While reading the books one was struck by their great variety. The hand-writing was good—much better than that which usually appears in the exercise books of these young people. The map plan was a common feature, Ordnance Survey symbols were used freely and scales were added. Snapshots and sketches in water colour and pencil illustrated scenery and incident. In many books the application of geographical principles was evident. During the holiday the Earth had been their teacher and they had liked her.

# OBITUARY

## Ellis W. Heaton

ELLIS W. HEATON was one of the now small company of the veterans who were geographers by conviction rather than by special training because no training was then available. Some of us looked especially to the historians, some to the specialists in the physical sciences and some to the biologists. Heaton was specially interested in the approach from the physical sciences and no doubt owed something, indirectly, to Huxley's famous *Physiography*. He was first and foremost a teacher, and very emphatically did not believe in "taking the Ge out of Geography." For the long latter part of his working life he was headmaster of the Municipal High School, North Shields, and he made his school and himself a centre radiating geographical thought in north-east England. He was one of the first geographers to be appointed to a secondary headship and he felt his special responsibility to the subject very keenly and worked with a steadfast enthusiasm. His school text books of scientific geography were long used and valued especially by serious teachers anxious to have a scientific foundation for their studies. He was one of the most senior life-members of our Association and the mainstay of the work in early days in his district. He held for years a seat on the Council of the Association and took his turn as a member of its executive. His fidelity was proverbial; and his active interest in every new enterprise for the Association was a great encouragement to its officers in the days of small beginnings and heavy risks.

H. J. Fleure.

# CORRESPONDENCE

## Between Dawn and Mid-day, July 11th, 1950

Mr. Fairgrieve sends the following extract from a personal letter received from Mr. Scarfe :—

" The route was via Prestwick, Iceland (Keflavik near Reykjavik), Greenland, Labrador (Goose Bay) and the St. Lawrence Valley. It was dark, rainy and cloudy over Scotland. In the early dawn of the northern latitudes we touched down on the grey, grim, bleak, bare, stony, starving land of Iceland. I didn't realise how bare and grim it was.

Except at Iceland and for a few miles beyond we were above the clouds. Then very luckily, still in early morning sun, the clouds broke as we approached the south-east tip of Greenland and there from 12,000 feet we had a spectacular view of ice sheets, glaciers, icebergs, pack ice and every possible glacial landscape feature. I had never realised that so many icebergs and so much ice-floe broke away.

The clouds closed in again very soon until we nearly reached Labrador. Then again we saw hundreds of icebergs mostly small. The coast of Labrador is most forbidding—bare, bleak, rocky and sandy, with many patches of snow. Except on north facing slopes the snow soon disappears inland, despite the rising elevation. The landscape is of rounded smoothed rock, smothered by millions of tiny lakes. Slowly as one proceeds inland vegetation appears, tundra, dwarf shrubs, trees, but it is not till Goose Bay is reached that one finds green grass or any lumbering. From Goose Bay there is the familiar Laurentian forest—forest, bare rock and lake in about equal amounts until one strikes the St. Lawrence.

Here we met warm weather, noticeable even in the plane, and a heat haze so that it was impossible to see across the lower St. Lawrence even from 10,000 feet. I did not think it could be so far along the river to Montreal or that the monotonously typical strip farms at right angles to the river, with the farm houses strung on an endless line along the coast road could reach so far, with a Catholic Church every now and then and its cluster of houses to make a village nucleus. No school Atlas ever gave a child any idea of the size even of Montreal Island. Damn Atlases."

# GEOGRAPHICAL ASSOCIATION

## BEQUEST TO THE ASSOCIATION

Members will learn, with a sense of deep gratitude, that in his will the late Dr. Hugh Robert Mill made a bequest to the Association amounting to one half of a tenth part of the trust fund that is to be created from the capital of his estate, and payable to us on the death of his widow. In this way Dr. Mill has added to, and perpetuated, the life-long interest that he always showed in our affairs, and has assured to us a very substantial gift. This marks the first bequest of this kind which the Association has received.

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The Annual Conference will be held at the London School of Economics from January 2nd to 4th, inclusive, with excursions on Friday, January 5th, either to Kew Gardens (where the party will be personally conducted by Sir Edward Salisbury) or to see the Roman excavations in the City of London. The Presidential address will be given by Professor Dudley Stamp, and we hope to include in our programme an address by Sir John Russell. There will be a joint meeting with the Royal Geographical Society and the Institute of British Geographers on Thursday, January 4th, at the house of the R.G.S. The full programme will be circulated to members early in December.

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The Spring Conference will be held in Hull in 1951 from March 30th to April 3rd. Full details of the programme and instructions for the booking of accommodation will be issued shortly. Early bookings of accommodation will be essential. We hope that it may be possible to make this an occasion when about twenty-four teachers of geography from all countries within the Western Union attend our conference as delegates, with a view to the institution of an International conference of teachers of geography in the near future.

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Plans for the Spring Conference in 1952 are under way. We hope to visit Tenby, Pembrokeshire, under the expert guidance and leadership of Professor Bowen. This should make the meeting a memorable occasion for those who can attend. Full details will be given in due course.

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The Hon. Secretary expresses apologies to all members for any delays that may have arisen in connection with Library book borrowings and correspondence, during the past few months. We have worked at headquarters under serious difficulties occasioned by both the removal of the library and staffing restrictions. We apologise also for serious delays in the printing of *Geography*, and for the delayed appearance of both the June and September issues. The Executive Committee is considering the desirability of changing our dates of publication with a view to obviating these and other difficulties that at present delay the publication of our journal.

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As reported in our last issue, the offices and library of the Association are now removed to Sheffield and all correspondence concerned with routine enquiries, library borrowings, membership, and manuscripts or other communications concerning *Geography*, should be addressed to Miss M. Oughton, B.A., who replaces Mrs. Mann at our new offices, c/o the Park Branch Library, Duke Street, Sheffield, 2. A full account of the new headquarters and proposed future developments will be given in a forthcoming issue of *Geography*. Meanwhile it can be stated that the Hon. Secretary is exploring ways and means of making our more commodious premises of greater service to members generally by the development of a large sheet map collection ; the provision of facilities for schools and college parties to visit headquarters in connection with field excursions and works visits in the Sheffield region, organised from our offices ; and of facilities for joint meetings in Sheffield of Branches from other regions. Details of these schemes will be announced in due course.

## SCHOLARSHIPS IN GEOGRAPHY AT OXFORD

Jesus and Hertford Colleges and St. Edmund Hall will hold a joint examination on 13th March, 1951, and following days for the purpose of making awards in Geography. At Jesus College one or more awards (Scholarships or Exhibitions) may be made for Geography. At Hertford College one open MacBride Scholarship of £60 and at St. Edmund Hall one Scholarship of £40 are offered for Geography. The examination will consist of an English Essay; a General Paper; a paper in translation from at least two of the languages, Latin, French, German; and three papers in Geography. The Scholarship at Hertford College is only offered in every *third* year and 1951 will be the first occasion on which the three colleges named have offered scholarships in Geography at the same examination. Full details about these scholarships can be obtained in the *Oxford University Gazette* of 28th June, 1950, which gives a complete list of all scholarships to be offered by men's colleges at Oxford in 1950–1.

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Attention is to be drawn to the Film Meetings for teachers of Geography to be held by the Royal Geographical Society on Thursdays 16th November, 1950 and 8th March, 1951. At the first meeting, three films will be shown by the Education Division, G.B. Instructional:

The Seasons

Tropical Forest Village

Salmon Industry of British Columbia.

The first will be introduced by Miss M. C. Simpson, the second and third by Mr. J. G. Cons. Both meetings are at 5-30 p.m. and open to all interested teachers. The entrance to the Hall is in Exhibition Road.

# REVIEWS OF BOOKS

MEMBERS of the Library should know that, with very rare exceptions, books reviewed in this journal may be borrowed from the Association's library. The review columns are, therefore, supplements to the catalogue.

**Geology of the Countryside round Leeds and Bradford.** H. C. Versey. 22·5 × 14·5 cm. ix + 94 pp. London: Thomas Murby. 1948. 10/–.

This book will appeal to a wide group of readers. The only qualification necessary to enjoy and profit from it is a nodding acquaintance with the countryside between the Nidd and the Calder, Upper Airedale and the Vale of York, together with a desire to acquire some understanding of it through field study. Those who have no previous knowledge of geology will find that its fundamental principles, in so far as they are exemplified within the area, are clearly explained in an introductory chapter which should also serve to arouse the interest of the uninformed in the subject as a whole. Up to a point the succeeding chapters follow the form usual in geological memoirs, each of the main formations being dealt with in turn. Here, however, the resemblance ends; descriptions of the scenery resulting from the erosion of the different types of rock are refreshingly free from technical jargon and stereotyped treatment. Consequently the whole makes much more pleasant reading than any professional publication or formal textbook.

A notable feature is the series of thirteen Excursions given at the end of the book. By his many years of field experience in the area the author is exceptionally well qualified to serve as a guide to its main points of interest, and the reader can rest assured that the excursions, so clearly if briefly sketched, furnish an excellent cross-section of the various structure and scenery to be found within reach of Leeds and Bradford. The inclusion of these Excursions will, no doubt, be much appreciated by those who have some previous geological knowledge and who wish to apply it in an area which is new to them. Nor will the earlier chapters appear elementary or tedious to such readers for general principles and local examples are skilfully blended in an original and attractive way. To those arranging field studies in local geography the excursion should prove particularly useful, although some shift of emphasis from the purely geological to the geomorphological will be necessary. It may be added that the text is well within the comprehension of sixth-form pupils.

The only criticisms which might be raised against this admirable book concern its price and form. A cheaper pocket size edition might have been more suitable for a publication intended as a *vade mecum* for the explorers of the countryside.

A. E. P.

**The Place-Names of the Deben Valley Parishes.** W. G. Arnott. 22 × 13·5 cm. 89 pp. Ipswich: Adlard & Co. Ltd., 1947. 7/6.

The writer of this small volume makes no claim to expert knowledge, but he has in fact produced a very useful and carefully documented introduction to the history of place names in his area. The book applies only to a limited district of 24 parishes but what it loses in the narrowness of its area, it tends to gain from the fact that it includes a wide diversity of name-types: village, hamlet, farm, ferry, ford and names, names of natural features and road points, and a few field names. Geographers and others would greatly benefit by the inclusion of a map.

D. S.

**Ashcombe.** C. Beaton. 14·5 × 22 cm. 124 pp. London: B. T. Batsford, Ltd. 1949. 15/–.

From 1930 to 1945 Mr. Beaton held the lease of an 18th-century house in a lonely part of the Wiltshire Downs and in these recollections there is sketched the life that was lived there by the author and the friends who visited him. Although

there may be some satisfaction in glimpsing unusual ways of living and entertaining, there seems too little of general interest in this private theme to make the book of wide appeal. N. P.

**The Land of Britain.** The Report of the Land Utilisation Survey of Britain. Edited by L. D. Stamp. Additional Part : The Channel Islands. G. Dury. 22 × 28 cm. 54 pp. 1950. 5/-. Published for the Survey by Geographical Publications Ltd. Obtainable from Edward Stanford Ltd., 12–14 Long Acre, London, W.C.2.

This volume is an extra, not included in the original scheme ; the land use of all the islands was mapped by photograph from the air—in two hours. The memoir is a little disappointing, and one is left with a vague impression of incompleteness. Partly this is due to the fact that no information is given having a later date than 1939. A war was on after that but, as there is some stress on conditions then, the absence of later information is noticeable, all the more because in an excellent resumé of the history of land-use for four or five centuries the most obvious fact is the extraordinarily varied, and quickly varying, use to which the land has been put. The dominant features which seem to have permanent effect would seem to be first, that the islands are horsts of very ancient rock descending steeply to lowlands of no great extent, and, secondly, that the temperature is warm and very equable with a high humidity, strong and abundant sunshine and high winds. Grass suffers scarcely any check ; fruit growing has flourished at different times ; early vegetables may be grown ; there is an absence of trees except on sheltered valley sides. The author treats the Channel Islands as a single land-use region, partly, no doubt, because the total area is small but also " because of their common interest in market gardening and dairying, in produce and stock export." The latter clear generalisation comes like a refreshing draft of cold water after a lengthy meal of Danish Smoerbro, but though there is a certain unity in the islands there are, or were in 1939, considerable differences, and certainly the land use of Jersey on the one hand and Guernsey and the smaller islands on the other differed more than many land use regions distinguished in other memoirs. In Jersey one quarter of the land was uncultivated, in Guernsey nearly half. In Jersey a quarter of the remaining land was in grass, in Guernsey a half. Tomatoes were grown extensively in both islands but under glass in Guernsey and in the open in Jersey. Flowers are grown for export in Guernsey but not at all in Jersey. Perhaps the most striking difference is with regard to potatoes. Climatic conditions are favourable but the damp is also very favourable for the spread of disease, and potatoes can be grown only by repeated and heavy spraying. In Jersey they are sprayed to prevent blight and early potatoes occupy over one third of the cultivated land. In Guernsey main crop potatoes are grown on a very much smaller area and sprayed to prevent the spread of the Colorado beetle. There were considerable exports of dairy cattle from both islands but no dairy produce is listed among exports ; 500 tons of butter were imported into Guernsey in 1938. J. F.

**The Belgian Kempenland.** F. J. Monkhouse. 22·2 × 14·3 cm. 252 pp. Liverpool University Press. 1949. 17/6.

This is a detailed systematic analysis of the small region, best known as the Campine, which is physically typical of the sterile sandy heathlands of the North European plain, but which has been transformed by progressive land reclamation during the last hundred years, and since 1919, by exploitation of its concealed coalfield.

The subject matter is methodically grouped into eight chapters dealing respectively with the physical background, the heathlands, agriculture, afforestation, exploitation of the coalfield, industrial development, the development of communications, population and settlement. Each chapter is subdivided into a number of more or less self-contained sections (e.g. Chapter V : Initial problems ; coal output ; the development of the collieries ; labour) and ends abruptly with no concluding geographical synthesis or assessment of the relative significance of the facts presented. The author has, however, followed closely his main theme : " the increasingly profitable use by Belgium of an area described in the early nineteenth century as consisting of ' sterile wastes even as the sands of the sea-shore ','' and displays an intimate knowledge of his region. The book contains a large amount of concise, fully-documented and up-to-date

information supported by many statistical tables and illustrated by seventy-one maps and diagrams. It is the product of a period of painstaking research and takes its place both as a work of reference and as an example of the kind of detailed study from which future regional geographers may be expected to draw their material. A. J. H.

**Jordbrukets Geografi i Norge : Geography of Norwegian Agriculture, B. Atlas.** Axel Sømme. 19·7 × 26·6 cm. 111 pp. Bergen : J. W. Eides Forlag. 1949. Kr. 20.

This atlas gives a comprehensive picture of Norwegian agriculture as it existed in 1939, and the atlas will later be accompanied by a descriptive text. The maps are provided with full captions in English and are therefore easily understood even without the text volume.

There are some sixty pages of maps covering climatic aspects, rural population and farming. The climatic data include maps of July temperatures and annual precipitation, and diagrams for a selection of climatic stations. The length of the growing season is not mapped, but this is a difficult problem in a country of such varied relief.

Aspects of population distribution and changes since 1865 form an interesting section and provide a useful background to the changes in cultivated land on farms and to the seter system. The use of seters in Southern Norway in 1939 is compared with that in 1907, and the accessibility by motor roads indicated.

A full set of distribution maps covers all the main crops and livestock, dairy production and market gardening.

To illustrate the text volume, maps of four selected type areas are included. These areas are the Jaeren plain, the Hedmark forests, the Opland mountain valleys and the Nordland islands. The inter-relation of farming and fishing economies in Nordland is introduced by a series of 12 maps, while the special aspects of the most northerly areas of Troms and Finnmark also receive attention. Statistical tables for the rural and agricultural districts complete the information.

This atlas should prove a valuable reference book to teachers and students of Norwegian agriculture. The maps are on a scale of 1 : 7,200,000 or 1 : 3,000,000 and are clearly drawn in black and white. Comparison of densities is, however, made difficult by inconsistency in the orientation of lines used for hatching.

R. T. C.

**Iceland Yesterday and To-day.** H. Leaf. 22·5 × 14·5 cms. 205 pp. London : Allen and Unwin. 1949. 15/-.

This is a travel book of the " chatty " type, a mixture of personal observations and impressions with snippets from other people and their books, plus a few statistics from official sources. The standard of writing is exemplified by the description (p.4) of the Vikings as " dressed picturesquely while driving their artistic galleys through unknown seas, bent on piracy " ; or, on the same page, " over everything seemed to hover an aura which on closer inspection was caused by vague clouds of colour of darker hues." These and their like could be forgiven, however, if some worthwhile picture of Iceland emerged, but the incompetence of the author to make such a contribution is revealed in such sentences as these :— " Furthermore, lava is quite good for certain trees, and it soon becomes apparent that most of the so-called forests of Iceland grow among lava-beds " (p.105); " Haymaking seems to be a passion with the farmers, who doubtless must do it to feed their cattle during the winter months " (p.67) ; " The truth is, Iceland is no colder than Edinburgh, and certainly, judging from my experience, has better summers " (p.22). There is, however, some value in the book in that it records aspects of the social and economic results of the recent Allied occupation of Iceland. There are twelve good photographs, two of which include the author, and a useful reproduction of Eggertsson's map. R.M.

**Die Pflanzungs Betreuung der Java Zuckerindustrie.** Albert Nieschulz. 21 × 30 cm. 151 pp. Berlin : Ergänzungsband 2. Beitrage zur Kolonialforschung. 1944.

This volume, one of a series of German publications on colonial economy and administration, analyses the factors which have made sugar planting in Java one

of the outstanding examples of intensive, capitalistic agriculture in the tropics. Although a large proportion of the work consists of a critical examination of the methods and results of manifold research projects carried out on such matters as sugar cane breeding, plant diseases, and the varying efficiency of fertilizers, there is also much of interest to the geographer. Sections on the dependence of intensive land utilization on the efficient management of water supply and the effect of the variegated soil pattern on sugar yields are weakened by the omission of the maps referred to in the text, but nevertheless give excellent summaries of the findings of a great number of workers in the field, including J. Mohr and V. J. Koningsberger. The work of soil mapping on a genetic basis with which these latter are associated is illustrated by a regional account of the Plain of Kendal, where the many and often quite abrupt changes of soil character are shown to depend not only on the stage reached in the process of tropical weathering but also on the structure of the plain and the different silt contribution of the five rivers which bring down their loads from catchment basins ranging from slopes of young volcanoes to heavily lateritised Miocene sedimentaries.

In addition, we may commend the sections on the methods of cultivation—the advantages, in the Java environment, of the trench type 'Reynososystem' which has replaced plough culture in most of the sugar districts; the adaptation of the perennial cane to a system of crop rotation and its relationship in particular to rice culture; soil exhaustion and the increasing costs of production in some of the older areas; the influence of land tenure regulations on the character of plantation organisation and labour supply; and the process of world searching and plant breeding which began with the work of J. M. Gonsalves on the Black Cheribon cane in the mid-nineteenth century and produced the almost perfect environmental fit with 2878 POJ cane in the 1920's. This latter is the key to the lessons Nieschulz draws from his study—that the low-cost production of sugar in Java was based not only on the physical advantages of the island but on the efficient use of those advantages by generations of practical planters and research scientists working together as a team. The difficult years in the world sugar market following 1930 merely strengthened that relationship and intensified the drive for efficiency. "Der Höhepunkt der Geschichte Javas war auf einer blühenden Landwirtschaft begründet." W. K.

**Ore Genesis.** J. S. Brown. 22 × 14 cms. 204 pp. London: George Allen and Unwin. 1950. 12/6.

This is a book which will arouse much discussion amongst mineralogists and mining geologists. During the last 25 years a great deal of field and laboratory work has been done on the paragenesis (mutual relations and time-sequence of minerals) and the zoning of mineral deposits. It has been shown that in many deposits in various parts of the world, the order of formation has been first the silicates, then oxide mineralisation followed by the sulphides, with the precious metals, if present, arriving last. According to the widely accepted Hydrothermal Theory, mineralisation was produced by very aqueous solutions, but the author of this book, who is a well-known American mining geologist, has reached different conclusions. He points out that the sequence of minerals is directly related to the specific gravities of the ore minerals and believes that instead of all the ores of the common heavy minerals and their characteristic attendant gangue minerals having been transported by water from a single reservoir, that there were a number of independent source magmas (pegmatitic magma with its silicates; iron magma, etc.) arranged in an increasing depth sequence. The minerals have been carried from these reservoirs not as solutions, but as vapours. Whenever igneous activity occurs and then subsides, the cooling of the earth from the surface downwards is regarded as causing the reservoirs to be tapped in their order of stratification, so that the silicates are deposited first and the deeper seated minerals later.

The greater part of the book is composed of the detailed evidence advanced in favour of this theme—evidence that is not too easy to read, for the argument is often involved, the print is distinctly trying to the eyes and the few diagrams are complicated. Two main lines are followed: firstly that given by the physical properties of the various ore minerals, though it is to be noted that a great deal of work needs to be done on the very relevant property of volatility; and secondly there is a discussion of paragenetic studies of a large number of ore deposits in different parts of the world. J.F.K.

**The Petrology of the Igneous Rocks.** F. H. Hatch, A. K. Wells, and M. K. Wells. 22·5 × 14 cms. 469 pp. London : George Allen and Unwin. 1950. 25/–.

In these days of shortages, the long awaited appearance of a fresh edition of a long established textbook is a welcome event. Particularly when, as in this case, the opportunity has been taken, with the help of a new collaborator, to make a thorough revision and to add much fresh material. The book is divided into five parts. Part I deals with the rock-forming minerals, including a long list of accessories. The emphasis is on optical characters, but due weight is given to mode of occurrence and to the atomic structure of the more important minerals. Part II opens with a very clear account of the mode of occurrence of both intrusive and extrusive rocks and then deals with the consolidation of magma. In the third and longest part, dealing with the systematic classification of the igneous rocks, there is a major change, of more interest to geologists than to many geographers. In place of the previous emphasis on silica percentage, the position of a particular rock is determined more by its mineral content. Geologists again will be extremely interested in the short, perhaps too short, part summarising current lines of thought on the problems of petrogenesis. But geographers will find much of value in the last part, dealing with the history of Igneous Activity in the British Isles, particularly in the maps showing the distribution of igneous rocks of different ages.

One very praiseworthy feature of the book is the very large number of extremely clear illustrations, which have come from the gifted pens of Dr. A. K. Wells and his son. The publishers are also to be congratulated on making so many of the blocks page size, for otherwise much of the detail would have been lost. By comparison the few halftones appear very smudgy and might well be replaced by line drawings in the next edition. One blemish is that the indexing is inadequate and those who wish to look up some particular rocktype, such as laurvikite, may well have to search through the pages. By contrast, a very full supply of references is given, mainly in the form of footnotes.

This new edition, the tenth, more than maintains the standard of its predecessors. In the reviewer's opinion, it is the most clearly written and illustrated textbook of igneous petrology now available and for these days, the price is very reasonable. J.F.K.

**Vahl's Climatic Zones and Biochores.** M. Vahl and J. Humlum. 18·5 × 26·5 cm. 80 pp. Copenhagen : Universitetsforlaget i Aarhus.

Professor Vahl's studies of world vegetation have received little attention in English-speaking countries, though his system, first published in 1911, has formed the basis of vegetation maps used for some years in school and university text-books of geography and in many atlases in Denmark. These vegetation regions, or " Biochores " (Köppen's term), are shown in 16 maps, one for each thermal zone (temperate, subtropical and tropical) in each continent. The boundaries of his zones do not always correspond with those shown in most atlases and wall maps in general use in this country, and it is difficult to find out whether they represent actual plant formations, as mapped, or the climatic zones which, he claims, define their distribution. There seem to be some inconsistencies as, for example, in the recognition of altitude as a factor in climate, for although Abyssinia is shown as an island of sub-tropical rain-forest in the midst of tropical savanna, the Norwegian high fjeld is mapped as coniferous forest together with the rest of Scandinavia ; and although various vegetation zones are carried along the flanks of the Andes, the tropical rain-forest is shown extending right across the mountains from the Amazon to the Pacific coast in Ecuador.

Professor Humlum has calculated the areas of each biochore in each of the continents and goes on to show the distribution of population and of grain production in each. The data of grain production are drawn mainly from the *Annuaire Internationale de Statistique agricole* of Rome, the years 1936 to 1938 being used as the most normal or representative. Difficulties are experienced in allotting countries, provinces and other units by which the statistics are published to the respective biochores, which do not, of course, respect administrative boundaries. Some interesting results emerge, but although the limits of cereal cultivation may ultimately be climatic, the volume of production is governed meanwhile by a number of other factors, and the present study tends to put an undue emphasis on climate as a controlling influence.

This booklet is a welcome contribution to the rather neglected field of study where botany, agriculture and climatology meet. Most of our regional studies start in this vicinity, and Professor Humlum's contribution builds up the picture of land use and economic development within the Natural Region.

The text has been translated into English by Mrs. Jorgensen and reads fluently, though occasionally technical terms sound unfamiliar, e.g. " amyliferous tubers " ; " caoutchouc " ; " cultural plants " (=cultivated) and " where the temperature is too low for the growth of forest, the vegetation passes into shrubbery."

Vahl's vegetation regions are available as a wall map on Eckert's equal-area projection with explanation in Danish, English and French :—*Klima og Plantebaelter*. (Climate and Vegetation Zones). Martin Vahl's system arranged by Reumert. Geog. Inst. Univ. of Copenhagen. 2 sheets 1 : 25,000,000. 1949.

A. A. M.

**Sir John Mandeville : The Man and His Book.** M. Letts. 14·5 × 22 cm. 192 pp. London : The Batchworth Press. 1949. 15/–.

Mr. Malcolm Letts points out that the foundations of the modern approach to the Mandeville problem were laid between 1876 and 1891 and that since the appearance in 1900 of A. W. Pollard's modernised Cotton text (a work both scholarly and easy to read) little work has been done on Mandeville, save for the Hamelius edition of the Cotton text, completed in 1923. He feels that the author of the *Travels* has been unduly neglected and sets out in this volume to enlist interest in Mandeville and his work. Book 1 deals with The Man and His Times, Book 2 with The Journey, and Book 3 with The Book and What Became of It.

Was Sir John Mandeville really Jean de Bourgogne, of Liége ? There can be no certainty but Mr. Letts inclines to the view that Mandeville assumed the name of Jean de Bourgogne, that he was in fact, as he claimed to be, an Englishman forced to flee abroad after slaying a count. He claims to have traversed " the three parts of the world " but in fact, of course, his work was a compilation and many items have been successfully traced to their sources. Although we may agree that " whatever Mandeville touched he made his own " it is none the less true that his appeal to many readers will rest on the fact that his work mirrored the ideas of his times—Jerusalem is in the centre of the world, Paradise in the east, Prester John and the Grand Chan are mighty potentates, rulers of realms in which marvels abound. As Mr. Letts suggests, we have in the *Travels* an amplification of the topics summarily and pictorially portrayed in the Hereford *Mappa-Mundi ;* the degree of correlation he finds significant.

This work by the President of the Hakluyt Society is a work of scholarship ; but it is not ponderous. Once picked up it is not easily put down ; the illustrations are of outstanding quality, and the Batchworth Press is to be congratulated on this production.

H.J.W.

**Cities in Evolution.** P. Geddes. 22 × 14 cms. xxxi + 241 pp. London : William & Norgate. 1949. 18/–.

Sir Patrick Geddes' famous work was first published in 1915 and has been unobtainable for many years past ; for this reason alone a new edition of this pioneer study of cities is very welcome. The original version has been shortened by cutting out five chapters which are now out of date, but a useful addition has been made by including an illustrated section devoted to Geddes' cities exhibition. He collected the material for this exhibition in India after his first exhibition had been sunk by the *Emden* in the first World War. New appendices include some stray essays and notes which amplify our knowledge of Geddes' philosophy. The general editor of the book is Miss Jacqueline Tyrwhitt whose valuable introduction includes the theme of a lecture given by Geddes in 1923. A brief biography concludes the volume.

It is not necessary to describe the contents of this well-known book which has exerted so much influence. Many of Geddes' original ideas and terminology are now generally accepted and have been developed by his successors. It is right that we should be reminded of his great contribution not only to the geographical study of towns but also to planning as a whole.

E. W. G.

**White Settlers and Native Peoples.** A. Grenfell Price. Cambridge : 21·9 × 14 cm. 232 pp. Cambridge University Press. 1950. 25-/.

Teachers of geography are indebted to Dr. Grenfell Price for a valuable survey of the effects of the impact of English-speaking Whites on the American Indians, the New Zealand Maoris, and the Australian aborigines, in a text which forms a fitting sequel to the authoritative earlier work by the same author on " White Settlers in the Tropics," and which applied similar methods to a study of the North European invasion of the Tropics.

The material is treated mainly historically, and shows how, despite the differences of people and habitat in these widely separated regions, white impact on the native has in every case been related to three phases. The first coincided with opening pioneer periods and an invasion on moving frontiers when the native population was decimated by the combined effects of a brutal occupation, savage retaliations, the spread of diseases, the adverse influences of alcohol, the disruption of primitive culture and society, the encouragement of tribal warfare, etc. The second phase was that following British philanthropic movements of the beginning of the nineteenth century, when an attempt to redeem the harm done resulted in the creation of native reservations, often unsuitable in character, and the seat of ineffective missionary and educative work. The third stage, relates only to the past few decades in most instances, and is marked by new government policies that are more enlightened, practical and scientific in outlook, and directed towards native populations that have to some extent adjusted themselves to the White impact and have themselves begun to enter a phase of partial recovery. This is associated with a numerical increase of the native populations (full and mixed blood) in the U.S.A., Canada and New Zealand, though there is still a decline in Australia. In all countries, however, it is the mixed bloods that are on the advance. Full bloods are decreasing in all cases except in New Zealand.

The book is a salutory reminder of the cruel and destructive significance of the invasion by Whites of the vast territories of North America, Australia and New Zealand ; an invasion which, while it led to the growth of nations of whites now numbering 150 millions, equally saw the destruction of an aboriginal population that may have numbered at least one and a half millions and which to-day, including mixed bloods, numbers less than half a million.

The text gives students of social geography much food for thought. An extensive bibliography is included. A. Gt.

**Background to Man.** S. B. Vickers. 14 × 21·7 cm. 171 pp. London : Chas. Pearson & Son, Ltd. 1949. 7/6.

In this work the author is concerned with the influence that environment has exerted on man, and in the preface acknowledges his debt to Professor Semple's *Influences of Geographic Environment.* He has, however, chosen examples nearer home and more recent historical events to illustrate the general theme. There are drawings and maps made by the author ; some of the former are very effective but one or two of the maps are too small and lack clarity.

A point for criticism is the author's tendency to be dogmatic. In his anxiety to give geographical factors their due prominence he either omits or minimises the influence of other causes, e.g., historical and racial ones. Thus in his remarks on the Lancashire cotton industry practically the whole emphasis is on the effects of damp atmosphere. Some of the statements made are misleading, for example, p.34, " The greater fertility of a soil is reflected in a higher standard of living." This is hardly borne out by the conditions under which the Egyptian and Indian peasants labour at the present time. Again on p.39, " On the other hand where a poor soil or climatic conditions prohibit the growth of a dense population the country can easily be invaded. This was the case in Australia where the white man quickly overran the continent." History affords many examples of people who under very adverse natural conditions have maintained their independence over long periods, and the occupation of Australia in the century following 1788 could hardly be called a rapid over-running. We are given other generalisations without concrete examples in support of them. Thus on p.120 we are told that " If the river system of a country is highly developed, it tends to retard the development of other means of transport, the railway in particular." Was this true of the Mississippi and its tributaries in the decade before the Civil War, or of the English canal system in the early 19th century ?

The absence of index and bibliography is a serious drawback if the book is to become a work of reference in school libraries, and these omissions should be remedied in future editions. The book can be recommended to teachers and students not merely for the information it contains but for the material it affords for research and discussion. R. W.

**North and South America. The New World Wide Geographies. Book 1.** J. H. Stembridge. 16 × 20·3 cm. 288 pp. London: Oxford University Press. 1949. 5/6.

This is an attractive book, which should accomplish the author's purpose of giving secondary modern school pupils an interest in, and an understanding of, the geography of the New World. The style is engaging (though perhaps a little too "chatty" in places), and the matter suitably selected; the maps and diagrams are simple and effective, and the numerous photographic illustrations in general well chosen and skilfully utilised in conjunction with the rest of the material.

These comments apply especially to the section on Canada in which there is a sureness of touch based on direct observation and the selective use of a wide range of accessible illustrative material. The treatment of the United States and Latin America, on the other hand, suffers from the effort to economise space by concentrating on the "high lights," the effect of which is to give a rather patchy impression. A little more room could have been found for the geographical connective tissue by cutting down the digressions on technical processes, e.g., steel manufacture pp. 123–125, or sugar extraction p. 170, which in any case are dangerous because young people are prone to substitute such descriptions for the real matter of geography. Some minor points in the South American section need elucidation or correction in later editions: for example, the photographs on pp. 219, 227 and 246 are not typical of the subjects or places indicated in the captions, *fiesta* is incorrectly spelt on p. 234, Illimani (p. 251) is not a volcanic cone, the Lima-Oroya Railway (p. 256) is not really "Transandine," Puerto Colombia (p. 256) should be Barranquilla according to the location given, and Bolivia in the caption, p. 261, should be Bolívar.

The book is supplied with a useful index and sets of very simple exercises. Of the three additional chapters on Fixing Position on the Globe, the Seasons and Maps, the last especially seems to have little connection with the geography of North and South America. E.W.S.

**Fruits of Field and Forest.** Marjorie E. Kirtley. 18·5 × 13·5 cm. London: Frederick Warne. 1948. 2/6.

An attempt has been made in this book for children 13–15 years of age, to approach the study of the geography of Europe through its peoples and their problems, but the length of the book is insufficient to allow more than a cursory examination of any topic. There are many apt illustrations as well as useful diagrams and questions. J. N. K.

**Beyond the Narrow Seas.** C. Midgley. 20·5 × 16·5 cm. Exeter: Wheaton. 1949. 2/9.

In this book for juniors the production of some of the chief commodities is simply explained. The writing is occasionally loose—"just right" is not an explanation of geographical conditions; while the standard of reproduction in some of the illustrations is not high. The book will satisfy the need in junior schools for information about world products. J. N. K.

**Geography: First Series, Book Three (revised).** A. B. Archer and H. G. Thomas. 20 × 26 cm. 112 pp. London: Ginn & Co. Ltd. 1949. 4/3.

This is a revised edition of a book first published in 1936; the facts have been brought up-to-date and some fresh illustrations substituted. As a geography of the British Isles it should be a useful book for preparatory schools and though the conversational method adopted is not always acceptable, the information is adequate and provides clear pictures of the activities of our fishermen, farmers, miners, etc. E. K.

# Geographical Articles in Magazines Received

CONTINUED FROM VOL. XXXV. pp. 73 and 74.

A—Australian Geographer. A of G—Annals of the Association of American Geographers AJ—Alpine Journal. A of Sc.—Advancement of Science. CGR—Calcutta G, Review. GJ—Geographical Journal. GR—Geographical Review. GSI—Geographical Society of Ireland. IA—International Affairs. IGJ—Indian Geographical Journal. JC—Journal of G. Society of China. J of G—Journal of Geography. JMGS—Journal of Manchester G. Society. NG—New Zealand Geographer PGA—Proceedings of the Geologists' Association. S—Sankhya : Indian Journal of Statistics. SR—Sociological Review. TPR—Town Planning Review.

**AFRICA.** T. N. BROWN, JMGS, '47–'49.—Parts of Barbary. R. G. GOODCHILD, GJ, June, '50.—Roman Tripolitania. D. M. SCOTT, JMGS, '47–'49.—Southern Rhodesia.

**AMERICA.** A. H. DOERR, J of G, May, '50.—Coal Counties of Southern Illinois. L. HEWES, A of G, March, '50.—Early Woodland and Prairie Settlement in Central Iowa. E. E. MILLER and R. H. HIGHSMITH, Jnr., J of G, Feb., '50.—The Hop Industry of the Pacific Coast. W. E. POWERS, J of G, May, '50.—Greenland Eskimos and their Environment. M. B. TRACEY, J of G, Feb., '50.—Mexican Mercados.

**ASIA.** N. AHMAD, IGJ, '49.—Some Planning Problems of East Bengal. H. P. BEATTY, JMGS, '47–'49.—Burma : Then and Now. S. P. CHEN, JC, Dec., '48.—Geomorphology of the Tan Lung Chuan Valley. C. A. FISHER, GJ, March, '50.—The Expansion of Japan. Part II. GJ, June, '50. B. GANGULI, CGR, June, '49.—Bengal Bihar Industrial Belt. W. KIRK, JMGS, '47–'49.—Town and Village in Burma. F. B. MAHMUD, IGJ, '49.—Cotton Growing in West Pakistan. S. McCUNE, J of G, May, '50.–Confusion in Asia. O. H. K. SPATE and E. AHMAD, GR, April, '50.—Five Cities of the Gangetic Plain. B. A. TATOR, J of G, March, '50.—Physical Geography of the Kunmig Basin, Yunnan. H. W. TILMAN, AJ, May, '50.—The Nepal Himalaya.

**AUSTRALASIA.** F. H. W. GREEN, NG, Oct., '49.—Mainly about South Island. C. HARVEY, NG, Oct., '49.—The Changing Agricultural Economy of Fiji. J. H. SHAW, A, March, '50.—Kosciusko or Townsend. D. S. SIMONETT, A, March, '50.—Sand Dunes near Castlereagh, N.S. Wales. N. R. WILLS, GJ, June, '50.—The Australian Iron and Steel Industry.

**BRITISH ISLES.** F. S. CONE, JMGS, '47–'49.—Central Highlands of Scotland. T. W. FREEMAN, GSI, '45.—Agricultural Regions and Rural Population of Eire. J. P. HAUGHTON, GSI, '45.—Low Level Surfaces of Erosion in the Wicklow Mountains. D. V. HEMMING, GSI, '47.—The Demesne at Mitchellstown, Co. Cork. A. D. LACAILLE, PGA, June, '50.—Deglaciation Chronology of Scotland. L. MITCHELL, GSI, '48.—Handspinning and Weaving in Ireland. W. SMITH, TPR, April, '50.—Location of Manufacturing Industry in Great Britain. M. M. SWEETING, GJ, March, '50.—Erosion Cycles and Limestone Caverns in the Ingleborough District. H. R. THOMPSON, PGA, June, '50.—Some Corries of N.W. Sutherland.

**EUROPE.** G. CHANDLER, IA, April, '50.—Greece : Relapse or Recovery. W. KLATT, IA, April, '50.—Food and Farming in Germany. Part II. F. A. ROPER, JMGS, '47–'49.—Mediterranean Seaboard. A. STONE, J of G, Feb., '50.—Western Germany.

**CARTOGRAPHY.** F. J. MONKHOUSE, TPR, April, '50.—The New Ordnance Survey Map, Series, 1 : 25,000. A. H. ROBINSON, A of G, Dec., '49.—An Analytical Approach to Map Projections.

**CITY STUDY.** R. GARDNER-MEDWIN and F. J. CONNELL, TPR, Jan., '50.—New Towns in Scotland.

**CLIMATOLOGY.** B. K. BIDVAI, CGR, Dec., '49.—Rainfall in Amraoti, 1891–1930. J. R. BORCHERT, A of G, March, '50.—Climate of the Central North American Grassland. S. ERINÇ, GR, April, '50.—Climatic Types in Turkey. S. M. NAQUI, IGJ, '49.—Coefficient of Variability of Monsoon Rainfall in India and Pakistan. A. A. MILLER, A of Sc., May, '50.—Climatic Requirements of Some Major Vegetational Formations.

**CULTURAL.** V. G. CHILDE, TPR, April, '50.—The Urban Revolution. D. SEN, CGR, Dec., '49.—Pachmarhi and its Painted Caves and Rock-Shelters.

**ECONOMIC.** J. FLINT CAHAN, IA, April, '50.—The Recovery of German Exports. A. GHOSH, S, March, '50.—Economic Classification of Agricultural Regions in Bengal. D. A. HILL, GSI, '47.—The Land Utilization Survey in

Northern Ireland. A. F. MANNAN, IGJ, '49.—Some Economic Aspects of Fisheries in East Bengal. R. E. MURPHY, A of G, March, '50.—Economic Geography of a Micronesian Atoll. D. N. WADIA, CGR, Dec., '49.—Metals in Relation to Living Standards. S. W. WOOLDRIDGE and S. H. BEAVER, GJ, March, '50.—The Working of Sand and Gravel in Britain.

**HUMAN.** N. K. BOSE, CGR, June, '49.—Adaptation to Environment, LIU EN-HUN, JC, Dec., '48.—Highland Settlements: Their Geographical Environment and Their Problems. G. D. MITCHELL, SR, '50.—Depopulation and Rural Social Structure.

**PHYSICAL.** E. CODDINGTON, AJ, May, '50.—A Hydrographic Approach to the Alps. C. A. COTTON, NG, Oct., '49.—Plunging Cliffs: Lyttleton Harbour. H. DINGLE, A of Sc., '50.—Modern Theories of the Origin of the Universe. R. W. FAIRBRIDGE, GJ, March, '50.—Landslide Patterns on Oceanic Volcanoes and Atolls. W. O. FIELD, Jnr., and M. M. MILLER, GR, April, '50.—The Juneau Ice Field Research Project. H. KUENEN, A of Sc., May, '50.—The Formation of the Continental Terrace. M. W. de LAUBENFELS, GR, April, '50.—Ocean Currents in the Marshall Islands. D. B. LAWRENCE, GR, April, '50.—Glacier Fluctuation in S.E. Alaska. H. PETTERSSON, A of Sc., May, '50.—The Chronology of the Ocean Floor.

**TEACHING.** L. BROOKS, JMGS, '47–'49.—Geography in Education. A. H. CLARK, GR, June, '50.—Contributions to Geographical Knowledge of Canada since 1945. G. G. MALLINSON, J of G, May, '50.—Elementary Science and Geography Teachers. E. E. MILLER and R. C. BURNHAM, J of G, March, '50.—A Simple Rain Gauge. G. MINADEO, J of G, March, '50.—Creative Work in Geography. C. SYMONDS, J of G, April, '50.—A Geography Assignment. B. VARLEY, JMGS, '47–'49.—The Increasing Importance of Geography Teaching. H. J. WARMAN, J of G, March, '50.—A Graduation Programme with Geography as the Core Theme.

**TRAVEL.** T. HEYERDAHL, GJ, March, '50.—The Voyage of the Raft Kon-Tiki. K. IMANISHI, GR, April, '50.—The Great Khingan Expedition. E. F. NORTON, AJ, May, '50.—Mount Everest: The Last Lap.

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